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E. BURGESS, Captain,
Secretary.

Whitehall Yard,
May 1888.

The Journal
OF THE
Royal United Service Institution.

VOL. XXXII. 1888. No. 143.

Friday, January 13, 1888.

GENERAL SIR DONALD M. STEWART, BART., G.C.B., G.C.S.I., in the Chair.

QUICK-FIRING GUNS IN THE FIELD.

By THORSTEN NORDENFELT, Esq.

ALLOW me to begin by stating that I approach with much diffidence this important subject, which must always remain somewhat unfamiliar to a man who has never taken part in actual warfare, but I have been encouraged in doing so by the thought that a constructor of guns who is not an artillery Officer may perhaps be able to throw out some useful hints and formulate some requirements, which may not yet have become sufficiently clear, in the same manner as an artillery Officer who is not a constructor can give most useful guidance to the man who designs the guns. I must also ask members of this Institution to show their indulgence of the many weaknesses in detail and in argument which I probably cannot avoid by joining in the discussion, and by pointing out, not only where I may be at fault, but also how the faults may be corrected.

My idea is, namely, that this subject is so very important that the time which the Council has granted me for this lecture will not be wasted if I succeed in awakening the interest of those who know the subject better than I can do, and in starting a discussion to-day, and a subsequent interchange of opinions, which may lead to clear views upon the question of light artillery, and especially upon quick-firing guns for such light artillery.

Many proposals have been made from time to time for solving the problems:—

(1.) How to construct a gun for field purposes, which combines great rapidity of fire with the greatest possible accuracy, even at long ranges.

(2.) How to protect the gunners by shields, and thus enable them to remain for longer periods and at shorter distances under infantry fire; and

(3.) How to diminish the disadvantage of the field gun-carriage running back on the discharge of the gun.

These attempts have hitherto failed, because no suitable quick-

firing guns have been made for the purpose with sufficiently heavy projectiles; because of the difficulty of carrying shields on the present field guns, which with their carriages, limbers, and ammunition, are already at, or above, the limit of weight for their team of six horses; and because of the impossibility of anchoring efficiently the present field guns with their high velocity of recoil to the varying quality of ground on which they have to fire.

By increasing the initial velocity, the English field gun has become more efficient with its flatter trajectories at long ranges, and has thus been made suitable to retire further from the increased accurate ranges of the new small-bore rifles with their greater rapidity of fire; but increase in weight of projectiles and velocity does not allow diminished weight even with recoil buffers, and with the very best quality of raw material in the carriages.

The direction into which the improvements in field artillery have moved has therefore supported the idea that field artillery must act at very long ranges with high velocity and heavy projectiles.

The old horse artillery 9-pr. gun has been condemned and replaced by the 12-pr. gun for horse artillery and field artillery alike; this 12-pr. gun, though excellent in its way, has shown itself too heavy for the very rapid pace at which horse artillery must move. Horse artillery itself may consequently be said to have "lost caste," and its special usefulness has become so limited that it has in fact practically become to all intents and purposes a field artillery; and the horse artillery gunners are now learning the sad lesson of making "strategic movements to the rear," in order to keep safely out of the range of infantry fire, instead of what used to be, and what, I feel quite certain, must again become their more glorious, though perhaps also more dangerous calling, of pushing forward by rapid and dashing movements, and by constant change of positions, into the very thick of the fray to support cavalry and infantry attacks.

I put most urgently before artillery authorities the question if they have seriously considered whether it is necessary to make all artillery in the field heavy and long-range artillery, or whether before doing so it would not be wise to endeavour to find a protected non-recoil gun for fighting nearer to the enemy, while leaving to the present field gun to do its part of long-range artillery duels.

The direction in which I would recommend that the search for such a gun should be made is something like the following:—

1. To reduce the weight of the shell to the limit which will allow the gun to be fired without allowing the velocity of recoil to be so great as to overcome the friction against the ground of the trail-end and of wheels held by an efficient brake, when assisted by the weight of the shield, and of two gunners sitting on the trail and on the side seat; or, in other words, without allowing the carriage to run back when the gun is fired.

2. To secure, in spite of the reduced weight of shell, sufficient accuracy and sufficient range for the purposes of the gun, by keeping the proportions and the balancing of the shell as ballistically perfect as possible.

3. To make up for the loss of weight and of effect of each shell by the increased rapidity of fire of a quick-firing gun, or even considerably to increase the weight of shrapnel metal fired per unit of time, at the same time as the powder could be kept in more perfect condition by being carried in made-up cartridges which do not suffer from damp. (I am aware that this will probably be done also with the present field guns, but if so, the weight of their ammunition will be increased, or the number of rounds reduced, and the new quick-firing guns would still have proportionate advantages.)

4. To take advantage of the saving of weight in the gun itself and of the carriage (which need not be made strong enough to resist the violence of the recoil caused by the heavier shell) for mounting an efficient shield to protect against infantry fire the reduced number of gunners necessary for the gun, these gunners in consequence of the gun not running back being able to keep well under cover of the shield.

5. To give the gun a sufficient traversing motion in addition to the elevating motion, thus enabling the man who lays the gun (No. 1) to follow, while firing, the movements of the enemy's troops better than can be done by the comparatively cumbersome laying by means of the handspike; and thus giving him the advantage of better being able to judge from the effect of one shot how he ought to lay the gun for the next shot, than he can do when he has to step to the side to fire with a lanyard, and then either run back to the gun which has bounded backwards, or wait until the gun is again brought forward.

6. To gain in rapidity and intensity of fire, which is suddenly, even if for a short period, poured out by a battery of quick-firing guns against bodies of infantry or cavalry, or against the enemy's artillery; more especially when the quick-firing battery can come upon the enemy's guns unawares, or can force them to fight at shorter ranges.

7. To determine the range by firing two or three shells from the non-recoil quick-firing gun more rapidly than the range can be found by the slower fire from the ordinary field gun.

8. To increase the number of rounds which within a given weight can be carried in the limber and ammunition wagon; the weight saved by reduced weight of shell and of powder should be greater than the weight added by the cartridge cases, and if the ordinary field gun is to fire made-up cartridges with metallic cartridge cases, the total weight saved in shell and powder enables the limber of the quick-firing gun to carry a proportionately greater number of rounds without deduction for weight of cartridge cases.

9. To carry the made-up cartridges in suitable ammunition boxes in the limber and in the ammunition wagon, so that a number of these boxes can be taken out and left with the gun on unlimbering, thus saving the ammunition service from constantly being exposed, while running backwards and forwards, and simplifying and expediting the reloading of emptied limbers and ammunition wagons.

10. To effect a saving in the number of gunners and horses in con-

sequence of no work being required, for fetching ammunition from the limber or ammunition wagon, and for moving the gun forward after each round.

11. To reduce the weight per horse within the limits of power of very rapid movements.

Several objections will probably be raised against these proposals, amongst others—

(*a.*) The apparent complication of having different guns for the horse artillery and for the ordinary field artillery. It should, however, be remembered that these two forces have really different kinds of work to perform; and that it cannot be right to diminish the efficiency of either if the objection to two kinds of guns can be overcome. Simplification in weapons of war is very important, but it can be carried too far, and becomes absolutely dangerous if it leads to a compromise by attempting to make one gun (which may not be perfect for either purpose) perform services which cannot efficiently be done by less than two different kinds of guns. The use in the field of two kinds of ammunition might be a disadvantage, but would not cause much real inconvenience if packed in entirely different ammunition boxes. One way out of the difficulty may be that in future the quick-firing guns may possibly supplant the ordinary field guns altogether, but I dare not press the supposition as yet.

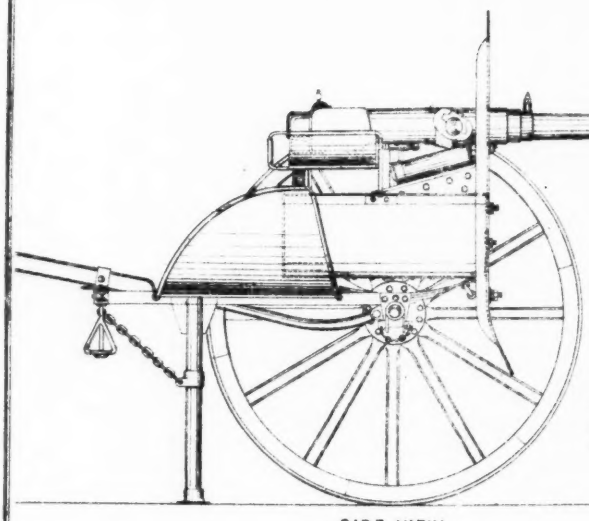
(*b.*) The difficulty of carrying sufficient amount of ammunition for a quick-firing gun. This is a difficulty which meets every advance in artillery as well as in small arms, and although, at first, it may appear to be serious, it has never yet failed to be overcome. It must be admitted that it may require more coolness on the part of an Officer commanding quick-firing guns, in order not to waste ammunition, than of an Officer who commands an ordinary field gun, but supposing the Officers and men to be well disciplined, there is no reason why more ammunition should be fired uselessly from the former gun, because if a certain weight of shrapnel ammunition needs be fired to attain a certain object, the only difference will be that the quick-firing gun will fire the required weight of shrapnel in a shorter time and with less risk, unless, indeed, a less weight of shrapnel may attain its object through the intensity of fire of the quick-firing gun.

On occasions, again, where the object is to fire the greatest possible weight of shrapnel ammunition in a given time, it will surely be worth while to take exceptional steps to provide the greater number of rounds required for the quick-firing gun.

For general service the present proportion of ammunition wagons or carts will, however, no doubt, be found sufficient.

(*c.*) The setting of time-fuzes may be considered difficult for the rapid discharge of a quick-firing gun. It has, however, been proved that one trained man can for several minutes set fifteen fuzes per minute, and it really takes less time to set fuzes for quick-firing guns, because there is less time for the enemy to move between each shot, so that as soon as the range is found orders are given for "3 shrapnel at 1,200 yards," or "6 at 1,500 yards," &c., and there is plenty of time for the two men to set the fuzes required.

NORDENFELT 3 PDR GUN O



SIDE VIEW.

WE

GUN .....

CARRIAGE

SHIELD AND

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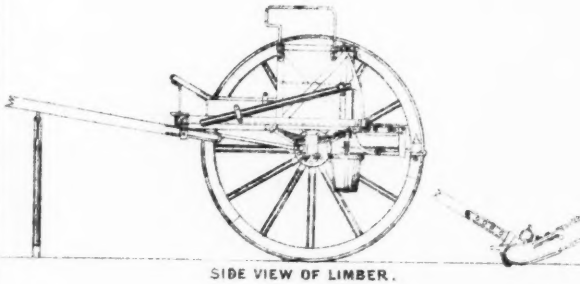
NORDENFELT 8



SIDE VIEW OF LIMBER.

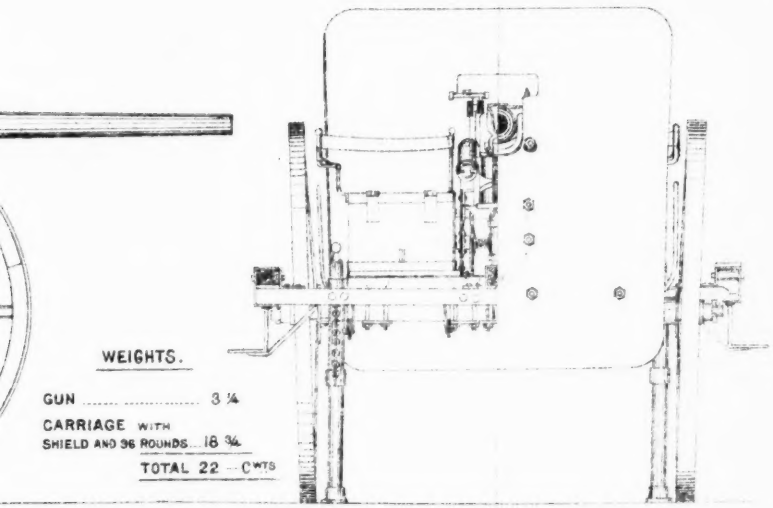
WEIG

LIMBER WITH 5

GUN .....

CARRIAGE WITH

GUN ON GALLOPING CARRIAGE.



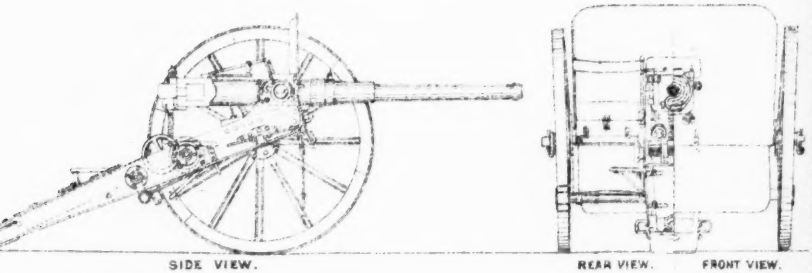
WEIGHTS.

GUN	3 ¼
CARRIAGE WITH SHIELD AND 36 ROUNDS	18 ¾
TOTAL	22 — CWTS

REAR VIEW. FRONT VIEW.

Scale $\frac{1}{26}$

FELT 8 P^{DR} Q.F. FIELD GUN.



SIDE VIEW. REAR VIEW. FRONT VIEW.

WEIGHTS.

LIMBER WITH 50 ROUNDS	15¼
GUN	6½
CARRIAGE WITH SHIELD	13
TOTAL	34¾ CWTS

Scale $\frac{1}{44}$

AMMUNITION FOR NORDEN

3Pr AMMU

POWDER CHARGE-10½ MUZZLE-VELOCITY-16

CASE SHOT.

LEAD BULLETS-89.

WEIGHT OF SHOT COMPLETE 4¾ Lbs

COMMON STE

BURSTING CHA

WEIGHT OF SHELL CO

6Pr AMMU

POWDER CHARGE-1¼ Lbs MUZZLE-VELOCITY-151

CASE SHOT.

LEAD BULLETS-200.

WEIGHT OF SHOT COMPLETE-8 Lbs

COMMON STE

BURSTING CHA

WEIGHT OF SHELL CO

8Pr AMMU

POWDER CHARGE-1¾ Lbs MUZZLE-VELOCITY-16

CASE SHOT.

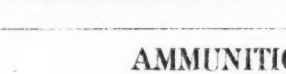
LEAD BULLETS-250

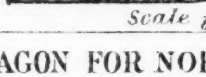
WEIGHT OF SHOT COMPLETE-10 Lbs

COMMON STE

BURSTING CHA

WEIGHT OF SHELL CO





Scale

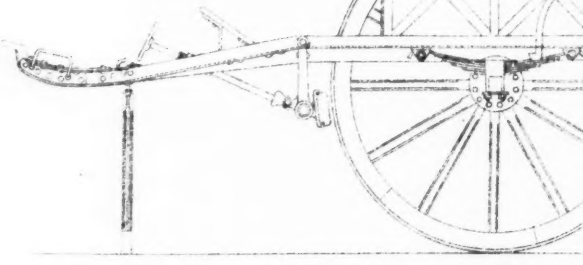
AMMUNITION WAGON FOR NO

WEIGHTS.

LIMBER WITH 50 ROUNDS 15¼

AMM. WAGON WITH 80 „ 19

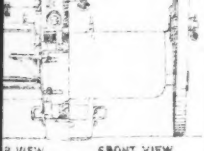
TOTAL. 34¼ CWTS



SIDE VIEW.

Scale

IEW.



R VIEW. FRONT VIEW.

ORDENFELT Q.F. FIELD GUNS.

P[r] AMMUNITION.

LE-VELOCITY-1510 f.s WEIGHT OF CARTRIDGE COMPLETE-5,2 lbs.

COMMON STEEL SHELL.

BURSTING CHARGE-4 oz.
WEIGHT OF SHELL COMPLETE-3,3 lbs

SHRAPNEL.

BURSTING CHARGE-1 oz.
LEAD BULLETS 48
WEIGHT OF SHRAPNEL COMPLETE-3,3 lbs

3P[r] AMMUNITION.

ZLE-VELOCITY-1510 f.s WEIGHT OF CARTRIDGE COMPLETE-8¾ lbs.

COMMON STEEL SHELL.

BURSTING CHARGE-9 oz
WEIGHT OF SHELL COMPLETE 6 lbs

SHRAPNEL.

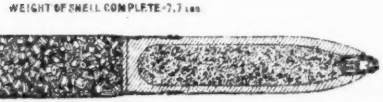
BURSTING CHARGE-2 oz
LEAD BULLETS-77
WEIGHT OF SHRAPNEL COMPLETE-6 lbs.

3P[r] AMMUNITION.

ZLE-VELOCITY-1660 f.s WEIGHT OF CARTRIDGE COMPLETE-11¾ lbs

COMMON STEEL SHELL.

BURSTING CHARGE-12 oz
WEIGHT OF SHELL COMPLETE-7,7 lbs

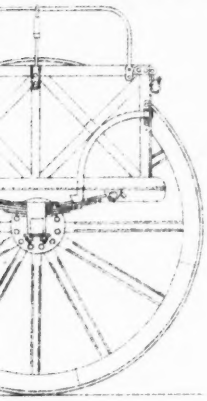


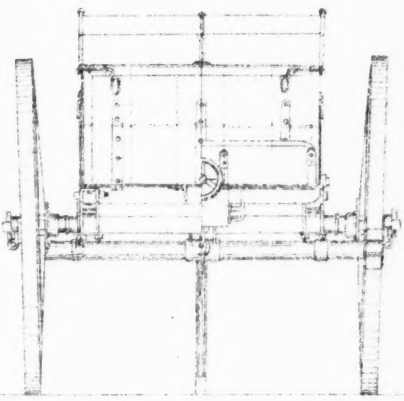
SHRAPNEL

BURSTING CHARGE-2¼ oz.
LEAD BULLETS-105.
WEIGHT OF SHRAPNEL COMPLETE-7,7 lbs

Scale $\frac{1}{8}$.

FOR NORDENFELT 8 P[DR] FIELD GUN.





Scale $\frac{1}{30}$.

FRONT. REAR VIEW.

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I am very anxious in this lecture to avoid any comparison between systems of guns, and although I have only my own gun before me, and must therefore refer to its arrangements and details of weight, &c., I wish it to be understood that I do not propose to invite any discussion as to different systems, but only regard my own gun as a representative of quick-firing guns in the field.

In the same manner, although I must compare my quick-firing gun with the service field gun, I do not of course seriously propose that my gun should at once take the place of the field gun, but rather that the former should be used as an auxiliary gun for special service, at least to commence with.

I have constructed three types of quick-firing field guns, viz.:—

8-pr. gun 2·4 inch calibre.
6-pr. „ 2·24 „ „
3-pr. „ 1·85 „ „

I propose first to describe the 8-pr. gun in detail, then to state the principal differences in the 6-pr. gun, and lastly to say a few words about the 3-pr. gun.

The principal details of the 8-pr. gun are as follows:—

Calibre	2·4 in.
Weight of gun	6¼ cwts.
„ carriage with shield	13 „
„ limber (with 50 rounds)	15¼ „
„ shell (shrapnel or common shell)	7·7 lbs.
„ powder	1·75 „
„ cartridge complete	11·5 „
„ case-shot (250 lead bullets)	10 „
„ bursting charge in common steel shell	12 ozs.
„ bursting charge in shrapnel (105 lead bullets)	2½ „
„ time and percussion fuze	8 „
Length of gun over all	92 ins.
„ cartridge	18½ „
Diameter of wheels	5 ft.
Track	5 ft. 2 in.
$\frac{d^2}{W}$	0·74
Initial velocity	1,650 ft. sec.
Remaining „ at 1,000 yards	1,197 „
„ „ at 2,000 „	965 „
„ „ at 3,000 „	830 „

The gun is drawn by six horses, the draught of each horse being below 6 cwts.

The maximum rapidity of fire is thirty rounds per minute, the average rapidity of fire for aimed shots is 15 per minute, equal to 120 lbs. of shrapnel (1,575 lead bullets) per minute, as against three shots equal to 36 lbs. of shrapnel (531 lead bullets) per minute for the 12-pr. field gun; or if I allow an average of four aimed shots for the field gun (which I believe to be excessive) the field gun would fire four shots equal to 48 lbs. of shrapnel (708 lead bullets) per minute.

If a battery of six quick-firing 8-pr. guns, after the range is found,

fires for half a minute, the fire would be exceedingly intense, or say forty-five shots equal to 360 lbs. of shrapnel (4,725 lead bullets). If on the other hand I consider that the object desired would be attained by firing 500 lbs. weight of shrapnel, the battery of six quick-firing guns would fire this in *forty-two seconds*, while a battery of six field guns would fire the 500 lbs. of shrapnel in 1·6 *to* 2·3 *minutes*.

The limber carries 50 rounds, the ammunition wagon carries 80 rounds, and the wagon limber 50 rounds, say with the case-shot cartridges on the trail, a total number of rounds per gun 123, if there is one ammunition wagon for every two guns, or 188 rounds per gun if it is found desirable to have one ammunition wagon for each gun. The gun detachment consists of four men and one horse-holder not counting the drivers. No. 1 sits on the trail seat, lays the gun vertically and horizontally by wheel-gear, and fires. No. 2 sits on the side seat, inserts the cartridge, closes the mechanism, opens it when fired and extracts the empty cartridge case, all by a to-and-fro movement of the hand-lever. No. 3 sets the time-fuzes, with assistance of No. 4, who also changes position of the trail by the handspike, if required. These two men kneel at the side of the trail so that all four are well under cover of the shield.

When unlimbering, Nos. 3 and 4 take out of the limber, before it moves away, the required number of cartridge boxes, and place them on the ground under cover of the shield, so that no men are exposed moving constantly forwards and backwards between the gun and the limber.

All four men are mounted on the march with one horse-holder, the horse of No. 1 being held by the bugler or by one of the drivers.

The 12-pr. horse artillery gun is served by 8 men and 4 horse-holders, not counting the 2 men mounted on the ammunition wagon nor any of the drivers.

There would thus be a saving for the quick-firing 8-pr. gun of seven men in the gun detachment, which will allow me easily to provide one ammunition wagon for each gun without exceeding the present total of men and horses in a battery. As my ammunition wagon holds 80 rounds, its limber 50 rounds, and the gun limber 50 rounds, the gun would be supplied with 180 rounds of shrapnel in going into action.

The ammunition wagon should always follow close to its gun on the march, and form up close in the rear, or better still at the side and in the line of the battery when in action, because the ammunition wagon loses much of its usefulness if kept, perhaps many hundred yards away, under cover (if available), and if not under cover it would be actually safer in the fighting line itself than a couple of hundred yards behind the guns.

On the axle of the gun-carriage itself I carry eight rounds of case-shot cartridges protected by the shield, in order to have them always handy, for use only in case of suddenly coming upon a line of infantry, which may have been hidden from view, and which may commence a terrible fire at perhaps only a couple of hundred yards range or less.

There would then be no time to take ammunition from the limber, but even six rounds of case-shot for each gun would give 9,000 case-shot bullets per battery, and as these would be fired within fifteen seconds no infantry could possibly face such fire within case-shot range.

I would prefer to arrange the provision of ammunition as follows: when going into action, the gun as well as the ammunition wagon are unlimbered, a few ammunition boxes are taken out of the gun limber and placed by the side of the trail under cover of the shield; when both the limbers retire, the gun limber is again replenished by ammunition boxes from the wagon limber. As soon as the ammunition boxes on the ground are emptied, they are exchanged for filled boxes out of the wagon which is close to the gun. In this manner the gun limber always remains filled until both the wagon and the wagon limber are emptied, and the gun can thus be supplied with ammunition out of its own limber, while the wagon fetches fresh ammunition from the spare supply in the rear.

I am anxious that it should be understood that I do not in any way advocate hurried aim or generally very rapid fire at long ranges, on the contrary, the quick-firing gun must be laid with as great care as any other long-range weapon, and without great skill and previous careful training of the gunners one gun is as useless as the others. But when the range has been found by a few carefully observed sighting shots, the quick-firing gun gains time, not only by remaining in the same position without running back, and by being laid vertically and horizontally by wheel-gear, but perhaps even more by the fact that No. 1 remains undisturbed, sitting on the trail with his attention directed all the time towards the enemy, and perhaps also by his feeling safer, protected as he is by the shield against infantry fire.

I am safe in saying as a general rule that when the present field gun fires 2 shots per minute the quick-firing gun fires 10 shots, and when the field gun fires 3 shots per minute the quick-firing gun fires 15 shots; while at short range the rapid fire of the quick-firing gun can be even doubled (my 6-pr. gun served by Belgian gunners fired in November last 36 rounds continuously in 60 seconds).

The burthen lays on me to show that my 8-pr. gun gives satisfactory accuracy, and I can state that between 3,000 and 4,000 yards my gun with well-balanced shell gives quite as good accuracy as the 12-pr. field gun, though beyond that range the heavier projectile may have the advantage.

I am under the impression that the word "accuracy" is sometimes used in two entirely different meanings. I believe that accuracy really means that a gun, which at a given range places one of its projectiles in the bull's-eye of a target, shall be able to place a number of consecutive shots as near as possible to the same bull's-eye. This kind of accuracy is not so much dependent upon high velocity as upon evenness of powder and evenness of weight, form, and concentricity of projectile, and details of rifling. The second meaning given to the word accuracy should really be

called "probability of hitting," and is applicable to a high velocity gun to denote the greater chance it offers of hitting a target if the gun is not perfectly laid, or if the distance is not correctly judged. This probability of hitting is most important at sea, where the enemy's vessel moves considerably for every second, but ashore it is not so important, and may even not always be an advantage. For instance, it is more difficult to have even velocities of consecutive shots from the same gun, the higher the velocities are; and the slight unevenness of the burning of the time fuze of a shrapnel tells to greater disadvantage, the higher the velocity is. When firing against troops behind field works, a somewhat lower velocity will give better effect from the greater angle of descent of the shrapnel fire. Also the higher the velocity is, the greater becomes the distance between the spots on the ground struck by the common shells of a short and of a long shot caused by unevenness in the powder.

For firing at sea I deny that there exists any limit to the velocity which is useful (and my sea-guns have been fired with easy pressure at above 2,700 feet muzzle velocity); but for firing ashore against troops I feel inclined to admit that we must make a compromise between a "sufficient velocity" and a "high velocity."

The new English 12-pr. field gun gives 1,720 feet initial velocity, the German 1,545 feet, the French 1,608 feet, and the Russian 1,350 feet.

The compromise which I have arrived at, or 1,650 feet velocity for 8-pr. and 1,510 feet for the 6-pr. and 3-pr. field guns, may consequently be considered quite satisfactory, especially when it is remembered that no field gun fired during the Franco-Prussian War with even as high velocity as the lowest of my guns.

	Angles of Elevation.			
	5°	10°	13°	25°
Nordenfelt quick-firing—	yds.	yds.	yds.	yds.
3-pr. gun.....	2,350	3,850	4,630	6,650
6-pr. gun.....	2,570	4,140	4,890	7,390
8-pr. gun.....	2,900	4,490	5,230	7,600
English 12-pr. gun	3,080	4,680	5,450	..
French 12-pr. gun.....	..	..	..	7,655
German 11-pr. gun	..	..	..	6,196
Russian 15-pr. gun	..	..	..	6,910

The 8-pr. gun can be considered sufficiently accurate up to 3,500 or 4,000 yards, and can consequently generally face even ordinary field artillery, because, although it has happened, through the formation of the ground or other causes, that field artillery has commenced a battle beyond 4,000 yards, the occasions recorded are very few indeed where the artillery on one side or the other might not

have pushed forward to between 3,000 and 4,000 yards before much ammunition need be expended. It may be said that first at 2,500 yards the artillery fire arrives at its full usefulness, and that within 1,500 yards it becomes almost irresistible.

I thus claim for my 8-pr. quick-firing gun *great rapidity of well-aimed fire* and *sufficient accuracy.*

In order to form an opinion of the advantages offered by such a quick-firing gun, I propose to analyze the mode of using it in the field, and in doing this I follow the ideas laid down for ordinary field guns in the well-known letters on artillery by Prince Kraft von Hohenlohe-Ingelfingen.

A. *For Defence.*

When the gun is used in an artillery duel at long range the 8-pr. common shell shows quite well with its heavy bursting charge, and the gun would even then have the advantage of more quickly finding the range; and when found the gun would fire equally carefully aimed shots more rapidly than the field gun. The great intensity of such a fire would be most difficult to resist, and the suddenness of it would be demoralizing to the enemy. Say, for instance, that a few shots are fired slowly to find the range, and that then the battery fires rapidly for one minute, the effect would be enormous.

With their power of rapid fire the quick-firing guns can afford now and then to cease fire altogether, and to retire or advance a couple of hundred yards, so as to force the enemy again to find the range, while the quick-firing gunners, knowing how far they have moved, can at once recommence rapid fire. Or the quick-firing guns can be echeloned, so as to diminish the evil effect of their own smoke.

When supporting infantry on the defence the guns would probably be stationed some 500 yards behind the infantry, supposing always that they can fire freely from there. The object of the quick-firing guns would then be partly to weaken or destroy the guns of the attacking party, and partly to fire against the enemy's infantry. In this position the ordinary field guns would suffer much from the fire of the advancing infantry, while the quick-firing gun's detachment would be protected by their shields, and thus be in good condition to act at the all-important time when the enemy closes for the final rush, to meet which some of the quick-firing guns would probably be brought up into the line of fire.

In consequence of the great rapidity with which a battery of quick-firing guns can fire for a short period, it need not waste ammunition by a constant fire at long range against an attacking column of infantry, but it can determine the range to given points which the attacking parties must pass, and can then suddenly pour out an overwhelming fire, after which it would again be silent until the attack reaches another spot, the range at which has in the meantime been proved, and while silent the guns would not offer a sufficient target for the enemy's guns, especially if some temporary shelter has been thrown up, which makes it difficult to distinguish the guns at long range.

It is true that this can also be done by ordinary field guns, but in order to fire the requisite weight of shrapnel metal to stop the advance, they must fire more continuously; and the sudden bursts of very rapid fire are more effective.

The intense fire of quick-firing guns will also be most useful when the attacking party may have taken advantage of the formation of the ground, so as to arrive within short range without having been exposed during the advance.

Another duty of the quick-firing guns on the defence would be to act as rallying points for the infantry if thrown back by the enemy, as soon as the guns are no longer masked by their own retiring infantry, they would then to a certainty stop the enemy's infantry by their shrapnels set for muzzle explosion, or by their case-shot fire.

It seems to be acknowledged that no artillery can be taken in front attack by infantry or cavalry as long as the guns have sufficient supply of ammunition, and the gunners are not demoralized.

As this was proved in the Franco-German War for ordinary field guns, how much more certain will not this axiom prove when applied to quick-firing non-recoil guns protected by shields. The German artillery is never allowed to retire without special orders from the Divisional General; when opposed to infantry it must be much easier with quick-firing guns protected by shields to obey such a rule, and it cannot but be a great saving of life to have the gunners under protection. An ordinary field gun would probably in such a position lose half its detachment, and there is evidence that in the Franco-German War every man was lost against such an attack, but the guns remained in position and, manned by fresh detachments, drove back the infantry attack. With quick-firing guns protected by shields it is probable that very few of the gunners would have been killed, as they would have remained under protection, and would not have been exposed in running the gun forward after each round, nor in running forwards and backwards fetching ammunition, as a sufficient number of ammunition boxes would generally have been left with the gun. The ammunition boxes are, of course, interchangeable, so as to fit into either of the limbers or into the ammunition wagon, and the limbers are interchangeable so far that either of the limbers can take the gun or the wagon.

The one question which is always difficult with a gun on the defence is, of course, how to bring up the horses for fetching the gun away, but if a quick-firing gun with shield can be relied upon never to be driven away by a front attack of infantry, there is more chance for these guns than for ordinary field guns to be withdrawn, if desirable, the moment after the attacking infantry has been thrown back, or when they are for a time demoralized by exceptionally intense shrapnel fire.

B. *For Attack.*

Prince Hohenlohe says that in order that artillery may be really useful, the gunners must strictly observe three important rules: the

first *to hit*, the second *to hit*, and third *to hit*, and this is equally important in attack as in defence, though more difficult in the former, for in defensive positions the Officer in command of a battery has more chance of knowing given distances, and more time to find certain desired distances before the attacking parties reach each of them.

A number of instances are recorded of artillery advances during the Austrian War, 1866, and during the French War of 1870, and on reading the above-mentioned letters with a view to search for opportunities for the use of quick-firing guns, it will be found that there is hardly one instance in which there can be any doubt that the suddenness and intensity from the fire from a quick-firing gun, or the protection against infantry fire which it offers to the men, would have been of the very greatest importance, on the supposition that the gun would have the same accuracy of fire at ranges up to 4,000 yards, and that the gunners would have as perfect training as it is possible to give at the schools of gunnery in peace time.

Before commencing an attack the General will, of course, endeavour to ascertain that there is a reasonable proportion between his own and the enemy's artillery. This being so, the duty of the attacking artillery must be to push forward as far as the ground and the formation of the enemy's forces will allow, always supposing that the flanks of the artillery are properly protected.

Having advanced as far as is considered safe, the quick-firing guns would find the range more quickly than the ordinary field guns, and should then have a good chance of quickly weakening or silencing the enemy's field guns. The quick-firing guns would advance from position to position as quickly as the advance of the infantry will allow, their main object being to support the other branches of the Service. Ordinary field guns would probably not advance closer than 1,500 yards from the enemy's infantry, but as the quick-firing gun detachments are protected by shields, they can probably advance to within 1,200 yards or even 1,000 yards. When the infantry advances the quick-firing guns support them by firing principally at the enemy's infantry and also against their field guns, in order to destroy them if they have recovered from the previous fire, or anyhow to endeavour to draw the enemy's gun-fire away from the attacking infantry.

In the heat of the actual rush of the infantry the quick-firing guns will probably advance to even closer ranges, and if the attacking infantry dislodges the enemy the quick-firing guns must advance into the very front line in order to secure the position gained. Should the attacking infantry fail to gain their point and be thrown back, the quick-firing guns would form rallying points for the retiring infantry and arrest the enemy's counter-attack, as these guns with their shields when in formation of batteries or divisions cannot be taken in front attack by infantry.

During the whole of these movements it seems to me clear that the intensity of fire and the protection given to the detachment by the shields must be of the very greatest importance.

C. *On the March.*

The quick-firing guns well protected by shields can with even less risk than the ordinary field guns follow the modern rules that the guns with their ammunition wagons should always march as near the front as possible, viz., next after the first regiment of the main body of infantry, whether in the advanced guard, in the first brigade or in the first division; and that their columns of reserve ammunition should not be allowed to be pushed too far back.

D. *For Support of Cavalry.*

The 8-pr. gun with 1,650 feet velocity is the most powerful gun which I consider practical without causing the carriages to run back, within the weight allowed for six horses, and without reducing the number of rounds carried in the limber below a useful figure.

An army in which the 8-pr. quick-firing gun is adopted would probably use this gun also for the support of its cavalry; but where the 8-pr. quick-firing gun is not adopted for general use, or in countries where it may be difficult to secure a sufficient supply of strong artillery horses, it may be advisable to use a lighter gun for the support of cavalry.

For such purpose I would in those cases recommend the use of a 6-pr. quick-firing gun of which the details are given below.

It is not long since the shells of field guns were much lighter in weight than to-day. In 1866 the German field artillery had hardly any field guns which fired heavier shells than 4-prs.[1] and 6-prs., and the next change in the German guns was to 9-prs.

It is of course clear that the damaging area of a 12-pr. or 9-pr. shrapnel is greater than that of an 8-pr. or 6 pr. shrapnel, but when the latter shrapnel are fired more quickly the collective damaging areas become larger, and having more spread they become more demoralizing.

Details of Quick-firing 6-Pr. Field Gun.

Calibre	2·24 in.
Weight of gun	4 cwts.
„ carriage with shield	12 „
„ limber (with 80 rounds)	15¼ „
„ shell (shrapnel or common shell)	6 lbs.
„ powder	1¼ „
„ cartridge complete	8¾ „
„ case-shot (200 lead bullets)	8 „
„ bursting charge in common shell	9½ ozs.
„ „ shrapnel (77 lead bullets)	2 „
„ time and percussion fuze	8 „
Length of gun over all	72 in.
„ cartridge	15¼ „
Diameter of wheel	5 ft.
Track	5 ft. 2 in.
$\frac{d^2}{W}$	0·85

[1] This statement was made inadvertently, and is explained in Mr. Nordenfelt's reply in the discussion.—ED.

Initial	velocity.....	1,510	ft. sec.
Remaining	„ at 1,000 yards	1,070	„
„	„ at 2,000 „	880	„
„	„ at 3,000 „	750	„

Number of rounds carried with each gun, 168 when one ammunition wagon is attached to two guns, or 248 rounds if each gun has its own ammunition wagon.

This gun when drawn by six horses gives only 5¼ cwts. per horse, and is consequently an exceptionally light horse artillery gun. If the number of cartridges carried in the limber is reduced to fifty this gun without shield can be drawn by four horses, each horse pulling about 6 cwts.

Either the 8-pr. or the 6-pr. guns can follow cavalry movements under almost any circumstances, especially the 6-pr. gun with six horses, as I cannot imagine any marches except in difficult mountain service where a horse cannot pull 5¼ cwts., when and where he can carry a man.

The guns following a cavalry division would be kept with the main body of the division under the General's direct orders, and the guns would probably not be divided into smaller detachments than batteries, except under very special circumstances, in which case the quick-firing guns with shield would have more chance of defending themselves in small detachments than ordinary field guns.

These guns would act very much in the same way as previously described for quick-firing guns in the field generally. They would be thrown forward, even nearer to the enemy than quick-firing guns supporting infantry, as the cavalry can follow them up more quickly after they have silenced the artillery supporting the enemy's cavalry. During the actual cavalry attack the quick-firing guns would play upon the enemy's cavalry, or partly upon their artillery so as to draw its fire away from the attacking cavalry. As soon as the attacking cavalry has advanced so far as to mask their field of useful fire, the quick-firing guns would cease firing and load, so as to be ready as a rallying point for their own cavalry, if the attack were to fail; or so as to gallop up and assist in harassing the retiring enemy if the attack were successful. When supporting cavalry the quick-firing guns would not find so much use for their shields as when supporting infantry, except that they may sometimes have to be left behind to defend a position againgst infantry, or to be sent forward to defend a position which may be threatened by infantry; or again, if near the heat of the fray, at the serious moment when the success of armies may be hanging on a thread, the quick-firing guns would no doubt be thrown in with the other artillery to help to turn the scale.

This is the 6-pr. gun which fired thirty-six rounds in one minute in Belgium in November last, and which there gave such excellent accuracy at 2,500 metres, that I am justified in pronouncing it accurate up to and beyond 3,000 yards.[1]

[1] These trials, which were carried out with this gun as a caponnière gun, were

It is also the same gun which is proposed—

(1.) For use on its non-recoil field carriage outside fortifications.

(2.) As caponnière gun (it fired as such 7,200 case-shot bullets in a minute).

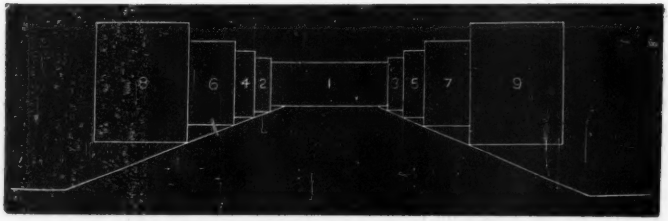
(3.) As a rampart gun on a special wheeled rampart carriage; and

(4.) For use in disappearing turrets for the defence of fortifications.

I would like to mention also my 3-pr. gun (or more strictly speaking 3⅓-pr.) on its galloping carriage with two wheels, for four horses, of which the following are the details:—

Calibre	1·85 in.
Weight of gun	3¾ cwts.
„ carriage with shield and 96 rounds in carriage	18¾ „
„ shell, shrapnel and common	3·3 lbs.
„ powder	10½ ozs.
„ cartridge complete	5·2 lbs.
„ case-shot (89 lead bullets)	4½ „
„ bursting charge in common shell	4 ozs.
„ „ shrapnel (48 lead bullets)	1 „
„ time and percussion fuze	8 „

against screens representing the ditch of a permanent work 250 metres long, 12 metres wide, and 5 metres deep; these screens were arranged thus:—



The results on the screens were as follows:—

Screen.	Throughs.	Lodges.	Splinters.	Total.
1	1,608	1,516	8	3,132
2	369	114	1	484
3	201	290	3	494
4	279	33	..	312
5	271	194	3	468
6	25	1	..	26
7	38	49	..	87
8	..	3	..	3
9	..	..	5	5
Total	2,791	2,200	20	5,011
On bottom of the ditch	2,921		83	3,004
Grand total.. ..	7,912		103	8,015

Length of gun over all	74 in.
„ cartridge	13¼ „
Diameter of wheel	5 ft.
Track	5 ft. 2 in.
$\frac{d^2}{W}$	1·05
Initial velocity	1,510 ft. sec.
Remaining „ at 1,000 yards	1,003 „
„ „ at 2,000 „	844 „
„ „ at 3,000 „	717 „

Number of rounds carried with each gun, 176 when one ammunition two-wheeled cart is attached to two guns, or 256 rounds if each gun has its own ammunition cart.

The gun on its galloping carriage is drawn by four horses; the ammunition cart also by four horses, each horse in either case drawing 5½ cwts.

The two-wheeled galloping carriage on which this gun is mounted is to all intents and purposes the same as first proposed for cavalry by Colonel Liddell, on the basis of Lord Charles Beresford's original galloping carriage, and which was constructed by me under the good advice of Colonel Liddell, General Arbuthnot, Major Wilson, and Captain Baden-Powell, and which now works exceedingly well, especially with the harness adapted for it by the last-named Officer.

The galloping carriage is quite as suitable for this quick-firing 3-pr. gun as for the rifle calibre gun; and the 3-pr. gun on its recoil mounting is the most powerful gun which I dare mount upon two wheels without fear of throwing too much strain of recoil upon the horse in the shafts.

This gun could be used for the support of cavalry, instead of the 6-pr. gun; the gun and its ammunition would be cheaper; it would require fewer horses, and would occupy less space on the march and in turning; but it would probably be most useful if attached to ordinary 12-pr. field gun batteries for the purpose of rapid range-finding and as flank protection, where from its great mobility it would operate with advantage against cavalry or infantry.

All the above-mentioned quick-firing guns for use in the field would fire principally or almost exclusively shrapnel shells with only a few case-shots (carried on the gun axle under protection of the shield in the 8-pr. and 6-pr.), and with a supply of common steel shells with heavy bursting charges for sighting shots, for firing against cavalry and against earthworks, gabions, and improvised defences.

It is my intention that these common shells should have a bursting charge which gives coloured smoke so as to distinguish the sighting shots. All these guns are of course especially useful against undisciplined or savage troops who usually attack in masses without proper formation.

The time does not allow me to-day to say anything about quick-firing guns for siege purposes, for the defence of fortifications, or for mountain service, but these subjects are most interesting, and several Continental nations are studying them seriously.

In this lecture on quick-firing guns in the field, I have avoided the

mention of rifle calibre machine-guns, in order not to create confusion. All quick-firing guns must be attached to or served by artillery, for like other field guns they require trained gunners accustomed to long-range fire, to time-fuzes, and to all the other delicate points to which artillery must be trained. But just as evident as it seems to me that all quick-firing guns must belong to the artillery, quite as strongly do I hold that rifle calibre machine-guns should be served by infantry and cavalry who are trained to fire rifles; and I cannot admit that because it is necessary that such machine-guns should be mounted on wheels and dragged by horses, these rifle calibre machine-guns need be served by artillerymen.

The requirements, the use and the training for shell guns and for rifle calibre machine-guns are totally different; the former have to act in divisions and batteries as collective portions of an Army Corps, while the object of the latter guns is more especially to strengthen the rifle fire if or when it would otherwise be too weak, and I am quite sure that both classes of guns are equally useful in their several spheres.

If the quick-firing guns are organized in large divisions and batteries, under direct orders of the General in command of the Army Corps, I hope that the rifle calibre guns may be allowed to act as small units, attached to regiments, or failing this, to brigades, so that they may be always present at the moment when their fire may be most useful.

Other and more experienced men must now develop the tactical and strategical questions which must be raised in connection with the organization of quick-firing guns in the field, and it only remains for me to express my very best thanks for the attention which you have been good enough to give me.

General Sir GERALD GRAHAM, V.C.: I think there can be no question of the great importance of the subject which Mr. Nordenfelt has brought before us, and which I believe is occupying the attention of all the great Continental Armies. As far as I understand the drift of Mr. Nordenfelt's paper, he invites discussion on the principle of employing quick-firing guns, and not on the merits of his own particular type. We must consider, therefore, what are modern artillery tactics. With reference to going to the front, Prince Hohenlohe, whom Mr. Nordenfelt justly describes as the greatest living authority, writes that the old prejudice against taking artillery within the limit of rifle fire has been entirely dispelled by the war of 1870–71. This is also acknowledged by our leading artillery authorities as represented by Colonel Brackenbury and others, who have lectured in this Institution, and who have stated that certainly in the later stages of an action it will be necessary to push the artillery to the front line regardless of heavy loss. We know that at Spicheren two Prussian batteries were advanced within 800 yards of the French infantry, and that although they suffered tremendously, losing half the detachments, they succeeded in enabling their own infantry to hold their ground. But it was not always possible even for such devoted artillerymen to stand against the tremendous losses inflicted upon them when advancing under rifle fire, as in the well-known case of four batteries of the 7th Army Corps at Gravelotte advancing under rifle and mitrailleuse fire, two of which certainly succeeded in holding their own in spite of tremendous losses, but the other two had to be retired, being almost annihilated. There can be no question that had the Prussians possessed guns of the type which Mr. Nordenfelt describes, their gunners would have been far better

protected, and their offensive power would have been much greater. The gun detachment would have been protected by the shield; they would have had their ammunition at hand, and I am quite sure the Germans would have taken care to have had enough ammunition. They would have been traversing by the wheel-gear action so as to avoid the exposure of moving by handspike, and as it would have been unnecessary to have had the gunners moving about there would have been less exposure and loss. The offensive power would have been immensely increased, for, if we consider the effect of firing fifteen rounds of case and shrapnel a minute, we see that it must do tremendous execution among infantry. I should, however, like to hear the opinion of artillerymen on the possibility of using shrapnel under heavy fire, for I am not competent to give an opinion, whether the nerves of the gunner can always be relied upon to judge coolly of the range, and to adjust the time fuzes with the rapidity and accuracy that would be necessary: that is a point for technical discussion. However, I think there can be no doubt that quick-firing guns move in the stream of modern progress; that as the breech-loader is an advance on the muzzle-loader in giving greater protection to the detachment and increasing the rapidity of fire, so the quick-firing gun is in an even greater degree an advance on the breech-loader. We consider suddenness and intensity of fire combined with mobility the guiding principle of infantry fire tactics, as also it is I believe the guiding principle of field artillery fire tactics, and you have the necessary conditions of fire discipline much more easily attainable with artillery than with infantry. Our Government are of opinion, and I believe justly, that it is necessary to provide our infantry with quick-firing magazine rifles. Does not it appear quite as necessary (unless there are some overwhelming technical objections) to provide artillery with quick-firing guns which will enable them to hold their own against infantry, and at the same time to give to the cavalry a gun with power and mobility to enable it to manœuvre with cavalry?

Captain H. JAMES, late R.E.: The question involved in the adoption of quick-firing field guns appears to me to go very much beyond the field gun question. It is a question whether we are to introduce fixed ammunition for use in all breech-loading guns. I believe it is more or less acknowledged that there is a difficulty, especially with big guns, in getting an efficient means of obturation for the breech-closing apparatus. The adoption of fixed ammunition, such as is used for quick-firing guns, such as is used in the Raffe field gun, which the French introduced in the later portion of the 1870–71 war, would obviate this difficulty. Of course the advantages of the use of this ammunition are plain and patent when there is any difficulty of breech-loading apparatus, and they are no less evident in the case of the quick-loading gun. The rapidity which it gives you has an enormous value in many cases in war. There was an instance which struck me when Sir Gerald Graham spoke of the German guns at Spicheren, and even a more forcible example occurred at Gravelotte, when the French advanced against the right Prussian attack late in the day, on the right. The Prussians fell back in this particular instance, and their absolute retreat was to a great extent stopped by one man, Grügge, who commanded a battery of artillery, and who made up his detachment by odds and ends of men, available from those fighting round his battery. That was an example when an infantry attack was repelled by artillery, and it is one in which quick-firing guns would have been of the greatest utility. I am very much inclined to differ from Mr. Nordenfelt on the question of calibre. Mr. Nordenfelt has said he thinks it is difficult to deal with a quick-firing gun bigger than an 8-pounder, but the experience of the world at large leads us to believe that you have only to propose a question to practical engineers for them to solve it. I am not prepared to admit that we are bound to adopt a gun which is inferior to existing field guns in order to get the advantages of quick firing without recoil, that is to say, I am not prepared to limit the quick-firing gun to an 8-pounder. I admit I am speaking generally. I have no plan in my head for consideration this afternoon, but I do think it may be possible in the future to have a quick-firing arrangement with even a 12-pounder.

Mr. NORDENFELT: Which does not recoil?

Captain JAMES: Which does not recoil. That is a question which will be fought out in the future, and not this afternoon. The advantages of a heavier gun are undoubted. Mr. Nordenfelt has only spoken of the shrapnel question, but there is

also the battering power which you get so much better from a large shell. Where the problem is battering, and not mere man killing, there the big shell, such as the 12- or even 20-pounder, has a very much more powerful effect than a number of 8-pounder shells, because the individual penetration is so much greater, and the destructive effect therefore very largely increased. Mr. Nordenfelt would lead us to believe that because the German field gun in the 1870–71 war was not of very high velocity, that therefore there is no great reason why we should have high velocity now. But it is a fact that since that war every nation in Europe has adopted a high velocity field gun, also high velocity rifles, and all nations in Europe are about to adopt rifles of very much higher velocity than any hitherto used in war. All this points to longer ranges, and undoubtedly, therefore, to higher velocities. I do not think you can admit Mr. Nordenfelt's distinction that you ask your Horse Artillery to do one thing, and your Field Artillery to do another. One thing that will strike anybody who looks after the actual records of war is this—that a gun has to do all sorts of duties, and whatever you wish to have done, you have to use the gun that is available. If you look at pictures of guns in big batteries in the Franco-German war, you will find the heavy gun, and the light gun, and the horse artillery gun side by side; hence it is an undoubted advantage to have every gun that you use in your army as powerful as you can have it. This attempt to get one gun to do everything has been made before. I do not say that Mr. Nordenfelt advocates this, but it is a point that may be alluded to hereafter. Napoleon III tried it, and introduced the *Canon Napoléon*, a smooth-bore gun, which fired a 12-pounder shell, and endeavoured to use it for every purpose in the French Army, but he did not succeed. There have been also attempts in Germany to introduce one kind of gun. A very well-known German artilleryman wrote a book almost on the question, but nobody has ever carried it out, because it is not practical to do so. You cannot have the one gun, although it is a very tempting thing to have, but you must be able to use your guns for all sorts of purposes: hence, in constructing a horse artillery gun, you must not leave the battering question out of consideration, which you do if you advocate a small gun. But there is one point in which I think the quick-firing gun is a great stride, and that is this. When General Congreve first introduced his rocket, he called it the "soul of artillery without the body." The body of artillery is nowadays the gun; if you have a quick-firing gun you may be able to use fewer guns, and replace them by ammunition wagons, and then you get a larger amount of ammunition to fire, and less useless dead weight in the shape of guns. It may be said that your gun is liable to injury—that it may be struck by shot. I ask you to look at the actual records of war, and you will find that the number of guns destroyed by direct hits, or anyhow whatever by an enemy's fire, is extremely small in any war of which we have accurate records. There is another point that is really more of a gunner's question than a retired sapper's; but it is one on which I personally have an opinion, namely, that I should not like Mr. Nordenfelt's system of ammunition supply applied to a battery in action. I think it would be rather dangerous to have the body of the wagon almost alongside the gun when in action; you would have to limber up the wagons as well as the guns, and you would have the danger of both teams being put *hors de combat*. Also the presence of a considerable amount of ammunition, even behind the shield, would be dangerous. If you had to make an advance to the front, it would be possible that the ammunition might be left behind, whereas, if you remained stationary, there might be the possible danger of its being struck by a shell. It does not follow that because the shield keeps out musketry fire, that it will prevent an enemy using shells against it, and you would have a mass of fixed ammunition amongst your gun detachment which would be dangerous. Moreover, the wagons almost in the front line between the guns would be in a position in which they would be eminently likely to be struck by the hostile shell. It has been proposed to have the limbers opposite the intervals between the guns, not behind them, because, it is said, they are less likely to be struck there. That may be the case, but if you have these wagons right up in the same line with the guns, so that the enemy can distinctly see what he is firing at, I think they would be in a very dangerous position. The whole question of quick firing is a very important question, and I hope I have started some points of discussion that others will take up

more in detail. There is one other point I should like to allude to—that is, that Mr. Nordenfelt is wrong in saying that the guns used by the Prussians in the 1866 war were chiefly 4- and 6-pounders. There have been no 4-pounders in the Prussian Army for the last hundred years.

Mr. NORDENFELT: Hohenlohe.

Captain JAMES: Hohenlohe is not the first book on artillery tactics I have read. The Germans, until the introduction of the new gun (c/73), constantly spoke of the old ones as 4- and 6-pounders, from this fact, that if they had been smooth-bores and fired round shots, that would be the weight of the round shot fired out of them; but it is not quite correct to say that these were 4- and 6-pounders, because they fired elongated shells of about 9 and 16 pounds respectively, and the smooth-bore guns used in 1866 were 12-pounders.

Captain ORDE BROWNE, R.A.: There is one question that I should like to ask Mr. Nordenfelt with reference to the shields. Does he propose to put those shields on all calibres of quick-firing guns, or only to use them for the quick-firing guns that come up in line with the infantry? I want to put it to him, whether the shield would not be a positive disadvantage when the pieces are outside infantry ranges. That shield, I should suppose, would cause shells to burst with percussion fuzes admirably, and would very likely cause shrapnel to burst without any fuze whatever, exactly on the detachment; therefore, I should suppose that the shield was intended to be used for the guns brought up into line with infantry, and those guns only, and that for such calibres as fight chiefly at longer ranges it would be better not to have them.

General Sir DANIEL LYSONS: May I ask Mr. Nordenfelt what resistance he intends his shields to have; whether they are only to resist bullets from a rifle, and, if so, at what range?

Captain R. F. JOHNSON, R.A.: I do not think Mr. Nordenfelt has much ground for claiming any advantage for his gun for advancing to close ranges with infantry, because it is not the difficulty of fighting the guns when you get them at close ranges that keeps us from going there; it is the difficulty of getting there. When once we are at close ranges and open fire, we can remain there. Has Mr. Nordenfelt in his weights made any allowance for necessary stores that have to be carried, such as blankets, intrenching tools, &c.? Looking at his boxes for ammunition, I am rather inclined to doubt whether they would be sufficiently durable; they do not look as strong as the drawers of the 13-pounder limber.

General BRAY: I have been waiting for the artillery Officers to speak on this question, because it is an artillery question entirely. It seems to me that they should speak on this subject, and give us the advantage of this discussion, it is not one for infantry Officers. However, my friend here suggested that a question should be asked Mr. Nordenfelt, viz., at what distance he proposed that these quick-firing guns are to hold their ground against infantry? I gather that they may hold their ground against infantry almost at close ranges; that is a point that I wish to ascertain unless I have misunderstood the lecturer. I think there are very few Officers of infantry—the artillery won't speak, you see—who have seen anything of a campaign who would not be very glad to have attached regimentally four or six quick-firing guns of rifle calibre under their own distinct command,—that is, infantry command. I gather from what I have read that these guns do not require trained artillerymen to use them, but that infantry soldiers and infantry Officers with short training would be able to use them efficiently in war. Therefore there are positions in which a Captain of a company with one of those guns, either a Nordenfelt or some other machine-gun, might hold a position that would require half a regiment to hold in war-time without the aid of such guns. They could secure a position, a picket, a bridge, a road, or a defile in such a manner that it would take a very large number of men to drive them out. I should say that the lighter and smaller these guns are made—those that I propose for infantry—the better; that they should not have more than two men to work them, one mule to draw the wagon, another mule for the ammunition; that they should be small and light, and should be distributed in large numbers throughout the infantry brigades of an army. I have great faith in the power of machine-guns—as a regular part of infantry armament—as distinct from artillery: it is most efficient and destruc-

tive when used in masses. Machine-guns could be used singly—in any position in a fight—by infantry, and will undoubtedly prove most destructive in future battles.

Captain STONE: I think Mr. Nordenfelt is perfectly right in advocating quick-firing guns of rifle calibre, but whether for field artillery or horse artillery, I think the practical experience of 1870 shows that the Germans never suffered from not being able to fire quickly, but they very often suffered from lack of ammunition, because the guns fired so quickly that the ammunition could not be brought up quickly enough. I think that is really the crux of the whole question.

Captain CURTIS: I think I am correct in saying that the blue-jackets in the Indian Mutiny kept off the rush of skirmishers with field-pieces, and they certainly would with 3-pounders.

Admiral COLOMB: May I ask Mr. Nordenfelt to say whether the gun can be arranged to fire from the shoulder, with reference to what was said as to training?

Mr. E. H. CARBUTT: I do not go into this question as a military question, but as an engineer I am very glad to come here and listen to Mr. Nordenfelt's paper. I am also very glad of the remarks of Captain James, who said that if you required a certain gun the engineers would make it for you. I quite agree with him that that is so, but what I want to insist on is that I think we ought to continue to do more than we are doing in the way of experiment. I think it would be very much better if the Government would consider that money spent in experiments is the wisest way you can possibly spend it. Let us prove if possible during times of peace, to our own satisfaction and that of our men, that we have the best artillery in the world, and then when the time comes they will do their work. It seems to be acknowledged that no artillery can be taken in front attack by infantry and cavalry as long as the guns have a sufficient supply of ammunition, and then gunners are not demoralized. I contend that our English gunners will not become demoralized if they are thoroughly convinced that they have the best weapon that they can get. I think also we ought to give them a good education, a good scientific education, if possible, and a practical training in the use of these guns, so that when they come to face an enemy they will not be demoralized. It would be better to spend double the money that is now spent in training men in order to make them perfectly *au fait* with what they have to do, and then when we have to face an enemy, those men will not become demoralized, and we shall be able to maintain the position we have always held.

Major GRIMSTON: I should like to ask what the expense of these quick-firing guns will be. A great many people, in talking about the defence of London, have recommended these guns, and it is a matter of moment as to what the probable expense of this 8-pounder and 6-pounder gun will be. Of course there is a great deal to be said as to whether it will beat horse artillery or not; that I shall leave to the gunners, but I have my own opinion upon the matter.

General Sir BEAUCHAMP WALKER: One point occurs to me on this matter, and that is the question of smoke. I asked Mr. Nordenfelt a question before we came into the room, and I have no doubt he is prepared to answer it. If his guns are to be used in anything like a long line, of course the quicker you fire, the greater will be the amount of smoke, and it seems to me most probable that the guns will have constantly to cease firing in order that their front may be cleared (or whatever point is obscured) by the wind, so as to enable them to see what they are firing at. I would also ask Mr. Nordenfelt whether, in the consideration of this quick-firing gun, he has also considered the question of smokeless powder, because in my own experience I have several times seen field guns, where great batteries are up together, obliged to cease firing to enable the air to clear.

Major GRIMSTON: Did I understand that Mr. Nordenfelt expects the horses to remain in the shafts during the recoil?

The CHAIRMAN (Sir DONALD STEWART): I should like to ask if the elevation and bearing of the gun are liable to much alteration from rapid firing? I ask this question, because the machine-guns that I have seen at practice not only changed in elevation, but after a few rounds deviated so much to the side from which they were worked that the targets were not struck at all.

Mr. E. H. CARBUTT: I do not know whether I quite understood Mr. Nordenfelt as to his shrapnel, but I understood him to say he was going in for bigger bullets

than previously. Is not that rather the opposite of what we are doing in our own rifle practice? that is to say, we are going in for very small bullets and very high velocity. I should be glad if he would kindly explain that more fully.

Major DUNDAS: I should like to ask about the heating of the gun. I have never seen the Nordenfelt gun fired, but I know the Maxim gun after being fired about a minute or so, even with a water jacket, becomes so hot that if I put my hand upon it, I draw it away a great deal more quickly than I put it on. If that be so when only firing the Maxim gun a minute and a half with all the water apparatus for keeping it cool, how would it be in the case of a larger gun?

Mr. NORDENFELT: Captain James commenced the discussion by mentioning the question of calibre, especially with a view to the necessity of a gun being not only distinctly a horse artillery gun, but also useful for general purposes, including battering. I did not venture to say that the 8-pounder gun is the best gun that can be made under the circumstances; I stated that the 8-pounder gun is the heaviest gun which I to-day considered practical for the purpose, always holding in mind that the recoil of the gun should be so far counteracted that the carriage does not run back, and limiting distinctly the total weight. I do not admit it practical, at present at least, to do anything for the carriage to anchor it, although we can do many things in fixed erections. That means that I am limited to a distinct velocity of recoil, as my total weights are limited by the six horses. Of course we are working to get larger and larger guns, but to-day we have not succeeded in getting a sufficiently practical means of increasing the weight of the projectile of a non-recoil field gun without decreasing the velocity and introducing other complications. As to battering, I will mention what I did in Belgium. I admit at once that the ordinary field gun would do more per shot, but I am not prepared to admit that it would do more per time, because the ground gets very much loosened and opened up by a few shots hitting tolerably near one another, and you very soon find that a shell will go through. That is another point upon which no doubt gunners have great experience, and upon which I have not so much experience, and if the artillerymen have not had experience of quick-firing guns I hope they will get it. A great many things have to be done before you can ever lay down a law upon this. I can simply suggest, and also state what I have done. I have no doubt some bigger guns may be made some day; but I began with the 2-pounder, then got to 3-, and then to 6- and 8-pounders. I am afraid I am very near the limit; but I shall be very pleased if I can get beyond it. I am not quite sure that I agree with Captain James when he mentioned about the similar gun for horse artillery. Captain James is perfectly right that all the guns will, no doubt, under many circumstances be drawn in to do the work required; but surely it will be wiser to have a light gun for horse artillery purposes, for following cavalry, and, in addition, to have a field gun which is not necessarily 12, but 14 or 15, and even a siege gun, for instance, and to have another gun which is light enough, with a draught of 5½ cwt. per horse instead of 6 cwt., to follow cavalry, if, as I am informed, the field gun to-day is rather too heavy for that purpose. The horse artillery 8-pounder would be useful, even if the effect for each shot would not be as great for battering purposes. Still the effect of the greater number of shots would be quite as great, and if not as great per shot, battering purposes are not the main object of the horse artillery gun; it is an additional object. We have in Austria a distinct horse artillery gun; we have in France the 8-mm. field gun for horse artillery; in Germany a distinct horse artillery gun; in Italy a distinct horse artillery gun; in Russia a distinct horse artillery gun; and in Spain we have a lighter gun and a heavier gun. Consequently these Powers are under the impression that some guns are necessary to move very quickly. As to the wagon alongside the gun, of course, as I said at the beginning of my lecture, I have never seen war; therefore I can only follow the opinion of others, and Prince Hohenlohe lays down as a fact, that if he dared, against the opinion of men whom he cannot move, he would distinctly lay down that they should be in line; at least it ought to be tried. The shield is perfectly right as a shield. The shield is made at present with ¼-inch hardened steel; it will consequently resist a rifle bullet, even the new small ones, and the lead bullets from a shrapnel, at any range within which they are likely ever to come. We have not tested them within 150 yards, and I am not quite sure whether at an

absolute close range they would not be penetrated. If so, I can increase the shield by one-sixteenth. It is quite clear that the shield explodes a shell, but my experience is against shells exploding within between 4 and 6 feet of the shield, because, before the explosion takes place, the fuze has to be lighted, and the shell has to burst, which takes time. At a very long range, when the velocity is very low, you might get it perhaps more quickly, but at anything like a velocity of 2,000 feet the shell would not explode within some 5 or 6 feet from the shield, so as not to do much harm. On the other hand, if they explode by the ears of the gunners, it would be very dangerous; therefore at long ranges it is possible it might be wise to have the shield removable. This would, however, be a complication which I am not prepared to recommend, but it might possibly be useful to have it so. There is another drawback to the shield, namely, that at long ranges it gives a distinct target; but, taking the view of Captain James, that very few guns have been smashed by shells in war, very likely the men's heads would also be comparatively safe against artillery fire. I believe I am right in saying that the greatest risk the gunner runs is from rifle fire and shrapnel. All these things have to be studied and considered. Everything is a compromise, and the question is whether the advantage of being protected against rifle fire can be more than counteracted by the burst shell. I bow at once to Captain James's correction about the 4-pounder and 6-pounder in the Austrian war; I read 4-pounder and 6-pounder, but it did not strike me that it represented the round bullet. Captain Orde Browne asked whether I proposed shields for all guns. I do for all quick-firing guns, because I do not admit that one gun could be prepared only for short range, and one be used for long range fire.

Captain ORDE BROWNE: Then you consider the rule will be that the gun will come within infantry fire.

Mr. NORDENFELT: I believe the rule must be that the guns can sometimes be forced to go within range of infantry fire. I think in our next war it will be done. You are bound to do so: you are bound to use every possible means of destroying your enemy, and if you are to leave behind one of the greatest means you have, you reduce your power. It is not only against rifle bullets that you have this protection of the shield, it is also against the bullets of shrapnel fire. The shrapnel may burst against the shield, but they would not gain any dangerous cone of bullets behind at the distance where the gun detachment works. The shield would protect to a great extent, though not entirely, the men behind it. A question was asked, what is the resistance of the shield? That I have already answered. Captain Johnson spoke about close ranges. That is really answered by the same question, whether you would actually advance within close ranges.

Captain ORDE BROWNE: As to field artillery, I quite admit that there may be times when it may be valuable for the guns to be close, but surely as a rule it is a great advantage, considering what infantry fire now is, to be kept out of it, especially as in so many cases you could produce practically the same result by being 200 yards further back. I understood you to send them forward as a rule, and to lay it down that they must not draw back till they get an order from the Divisional General. I should have thought he would have been a reckless General Officer to recommend those tactics.

Captain R. F. JOHNSON: I am satisfied that some of the artillery will have to advance to close ranges, but I said I did not think it was right to claim any advantage for quick-firing guns with shields over ordinary guns, because the difficulty does not lie in fighting the guns when you are at close ranges, but in getting them there.

Mr. NORDENFELT: That is perfectly right, but it is entirely in our own hands. The enemy might force me to close fire and might advance upon me. The infantry attack artillery, and I might not have the choice of remaining at long range. Captain Johnson asks whether the necessary stores are included in the weights. To a certain extent they are, but not entirely—I plead guilty to that—I have not overlooked it. All the heavy things are included in the carriage weight, but not some of the light ones—blankets, for instance—I do not believe they are in, but I have a very sufficient quantity of ammunition, and if I had one box of six cartridges less I should have room for a good many blankets. But I admit, as Mr. Carbutt

says, everything ought to be done and experimented on in time of peace; the guns ought to be thoroughly tested, more than an individual can do. As to the durability of the boxes, we have driven them about considerably; but again they ought to be driven more thoroughly than we have been able to do. But I believe as to the drawers of the present wagon, the very thing which Captain Johnson mentions, that they look spidery and weak, is an advantage, because being loose and elastic, they do not break so easily. The weight of each cartridge is supported in a solid base, very strongly connected, and I think they are sufficiently strong. General Bray began to express my own feelings entirely. He said, "Where are the artillery Officers?" I was very sorry that no "gunner" has spoken, but perhaps it is a compliment. Perhaps they did not like to speak in favour of their own guns, being naturally very bashful. But I wish they had, because I really honestly do not wish to lay down the law for anything at all connected with field work in actual war. I hope, however, that they will pitch into me by letters or through the Service Journals or in any other way they like, because my wish is really to ventilate the question. General Bray mentioned about the use of these guns for infantry; whether they could really hold their ground, and at what range? At all ranges: by shrapnel fire at long ranges, and when the infantry get closer, the actual range of case shot is from 500 to 700 yards. With the shrapnel we can meet the infantry at any reasonable distance. I do not believe the infantry will ever get within actual bayonet range against the gun. The infantry soldiers would have to use machine-guns. I cannot admit that infantry or cavalry soldiers, who have many other things to learn, should also learn fuzes and the things connected with artillery; but my other gun that has now been tried very extensively in the Army—the rifle-calibre machine-gun—that gun is entirely within the range of the training of infantry and cavalry soldiers, and therefore, I believe, that is the one that suits them better. Captain Stone mentioned the difficulty of ammunition. Of course that is my main difficulty; there is no question about it; but I think I have assisted in solving it so far as to show that you can fire a gun, you can serve a gun which does not run back, and when you do not require to run so often for ammunition you can serve it with fewer men and horses, and if you utilize the men and horses thus saved, for more ammunition wagons, you probably will approach as near as you can to a sufficient supply of ammunition. There is not the slightest doubt that in the next war the trouble of the General will not be to rely so much upon the courage of his men as to bring up the ammunition and the commissariat. That will be the heaviest work of all, but I believe the nation and the General who does this will have a distinct advantage over the opposite side. In reply to Admiral Colomb, I may say there is no reason at all why you should not fire from the shoulder. I began with a 3-pounder gun on two wheels. There is no objectionable strain on the horses. There is a recoil carriage, and the gun recoils without moving the carriage. Of course the horse who supports the shafts is not ridden. The horse is in the shafts, and the blow or the pressure on his back is very slight. The gun recoils—it is not a blow at all, but is a softened pressure. Sir Donald Stewart questioned whether you can fire a few rounds at a time without relaying the gun. I cannot say that you can fire several rounds at long ranges, but at short ranges you certainly can fire two, three, or five rounds through the smoke at an advancing enemy. I was under the impression that we could claim to fire volleys of three shots without laying the gun each time, but for long ranges we have given that up. I can do it at short ranges if the enemy is very close to me, but at long ranges I cannot do it without loss of accuracy. If you are on firm ground it is all right, but if you have one wheel against turf, and the other wheel free, there is a shifting motion of the carriage. You cannot possibly avoid it. If I could, I would have claimed it as an advantage. Sir Beauchamp Walker's question about smoke is an exceedingly important point. No doubt so many clever minds are now occupied with the endeavour to make smokeless powder that we shall arrive at it some day. At the present moment I have not seen or heard of any definite experiments which have even gone so far as that. I cannot say that within any measurable time we shall get smokeless powder, but I have no doubt we shall get it. What we have arrived at is a considerable diminution of the smoke in a good many different powders, and the smoke itself under certain

atmospheric circumstances is no drawback. If the smoke rolls away in the direction of the enemy, it does not interfere with firing, but I have a difficulty in admitting that it stops me more than it stops others, because I fire so much quicker than a field gun that I can fire two or three shots, and can afford to wait for a clear range before firing the next two or three without losing in total rapidity. Under any circumstances when I have smoke coming from the side, I should be in the same position as the field gun. Sir Beauchamp Walker mentioned, which is very important, and which brings the whole thing perhaps more against me, that when you fire in line (suppose you have 100 guns in line) of course there is a tremendous amount of smoke all over the place, and it might be possible that the guns could not fire. I suppose that happens to all kinds of guns. Mr. Carbutt mentioned making experiments and training. I have been several times allowed to speak in this Institution about that, and I feel exceedingly strongly the enormous saving it would be if this nation spent ten times as much in experiments as they now do, in order to avoid the possibility of things turning out wrong at a critical time, and the evil effects thereby produced upon men's minds. I ought to say that I believe the 12-pounder field gun has been very soundly threshed out and experimented upon in every possible way. Major Dundas asked how about the heating of the barrel, and mentioned the Maxim gun. Maxim's gun of course fires 600 rounds a minute from one barrel; it is made of comparatively thin steel, and gets very hot. I believe he claims that it does not do any harm, and perhaps it does not, but in this quick-firing gun the time between each round seems to be quite sufficient to cool the gun. We fired at Portsmouth on the "Excellent" another 6-pounder gun of mine, 400 rounds at a spin, at a rapid rate of fire. The gun was very hot, but not so as to interfere with accuracy or with anything else. You could not touch it with your hand, but the men must learn not to do that, and when you have not to run the gun forwards and backwards, the question of the barrel being hot does not matter much. We fired over and over again 36 rounds a minute, and the gun-barrel did not heat more than allowable. Sir Donald Stewart asks a question about elevation and traversing being likely to be lost for each shot. I have to admit—there is no prevarication about it—I have to admit that at long ranges I must aim for every shot. I cannot at long range fire a succession of shots without relaying, not so much for elevation as for traversing. In soft or marshy ground the elevation also changes considerably. There are so many circumstances that vary that I must aim every shot, although at short ranges I can fire several together.

The CHAIRMAN: Gentlemen, before we separate I hope you will allow me on your behalf to thank Mr. Nordenfelt for his very interesting address. If I do not misapprehend his object, Mr. Nordenfelt desires to demonstrate the special advantages which he claims for machine-guns both in attack and defence. The development of his ideas on the tactical uses to which these guns may be applied seems to me to deserve the careful consideration and criticism of practical artillerymen. I am myself inclined to be conservative in military matters, and for the reason that changes, and what are sometimes called reforms, are not always improvements. At the same time we cannot afford to stand still. We must keep abreast of the times in arms, in armour, and in all the material of war. Machine-guns may not be theoretically perfect in all respects, but they possess special advantages which no modern army can afford to ignore.

Friday, January 20, 1888.

GENERAL SIR BEAUCHAMP WALKER, K.C.B., Vice-President, in the Chair.

THE PRINCIPLES WHICH GOVERN THE HANDLING OF THE ARTILLERY OF AN ARMY CORPS.

By Captain R. F. JOHNSON, R.A.

THE scope of this paper is defined by its title. What may be called the technical tactics of artillery (such as its fire discipline, details of supply of ammunition, &c.), will not be considered, but only those of the rules for its tactical employment which it is necessary for all Officers of other branches to know, in order that its co-operation may be complete. Moreover, the *rôle* of the artillery which will belong to a normal British Army Corps will alone be dealt with, because the employment of more or fewer batteries with larger or smaller bodies only requires an adaptation of the same principles; while the action of horse artillery with cavalry is worthy of and should receive entirely separate consideration.

The opinions set forth for your criticism are mainly based on a study of the work "Field Artillery Tactics," by Lieutenant-Colonel von Schell, of the Prussian Artillery, and of the "Letters on Artillery" of Prince Kraft zu Hohenlohe Ingelfingen, which have recently been translated by Lieutenant-Colonel Turner and Major Walford respectively.

I especially hope to elicit the criticism of Officers of the other arms, because their views as to how our assistance is to be given to them must be all-important.

The primary unit of artillery is the battery. This with us, and most other armies, consists of six guns with their *personnel* and equipment, divided for purposes of supervision into three divisions, each under a subaltern.

The number of guns, six, has been fixed as being better for unity of command and control than a larger one, and because it is the smallest compatible with a thorough development and a constant maintenance of fire. Therefore it may be taken as an absolute rule that, except in very special cases such as street fighting where room is wanting, the battery, *i.e.*, *the fire unit*, is never to be broken up into fragments. Batteries are often broken up at field days, and I suppose there is some strong reason for their being so, for a practice that can

never obtain in war against civilized troops would otherwise be forbidden.

For purposes of discipline and facility of manœuvre, the batteries are formed into groups of two or three, each under a Lieutenant-Colonel. These groups are officially called "Divisions;" but, as in a discussion of combined tactics that term leads to much confusion, I shall throughout use the word "group" instead of it, and I shall also, to ensure clearness, call the Divisions of an Army Corps "Corps Divisions."

As to gain the best effect it is essential to combine the fire of more than one battery, and as a battery changing its position is during the movement without self-defence, it is desirable that the batteries of a "group" should always work together, and a "group" can be regarded as the "*manœuvring unit*" of artillery in as full a sense as a battalion is that of infantry. It is scarcely necessary to remark that the best results cannot be obtained if these units are only formed at the moment of mobilization.

With us the distribution of the artillery of an Army Corps is a "group" of three field batteries to each of the three "Corps Divisions," and an independent artillery brigade, called the Corps Artillery, consisting of two "groups," one of three horse and the other of two field batteries. A single Army Corps will also have one horse battery belonging to its cavalry brigade, and two field batteries on its lines of communication; but with an Army, the cavalry will probably be formed into an independent Division with a "group" of three horse batteries, and the number of batteries on the lines of communication may, or may not, be increased.

This distribution and its object must not be forgotten. The artillery of a "Corps Division" is an integral portion of it, and no more independent than one of the infantry brigades. On the other hand, the Corps Artillery may be regarded as an independent Division. Accordingly, though both act together in the first phases of a battle under the commander of the artillery of the Corps, the divisional "groups" must march with their own "Corps Divisions," and be so placed on the field that they may fight with them, when the artillery duel is finished; at which time the Corps Artillery will have to connect the attacks of the different "Corps Divisions," perhaps occupying ground so as to allow of an extension of the line, give support at the most important point, and, aided by the guns of the less actively engaged Divisions, prevent the hostile artillery resuming the fight.

Before proceeding further, I am anxious to draw attention to the great importance of a clear understanding as to who is to give the various orders to the artillery.

Whether it has been with an idea of not hampering its movements, or in consequence of the arm having a special staff of its own, that this has hitherto been left very open in our regulations; and whether the exclusiveness *formerly* cherished by *all* artilleries has contributed to the difficulties of the subject, need not be discussed. But, however much artillerymen have been to blame in the past, I believe that now

no one sees the disadvantages (indeed they should be called the dangers) of exclusiveness more clearly, and that they will welcome any reform which will effectually destroy it.

In thus urging the importance of settling the proper origin of orders, I must ask you to acquit me of under-estimating the value of individual initiative. Though everyone must be held responsible for what he does, that is quite different to holding a subordinate responsible for an omission to do something he has not been ordered to do. To illustrate my meaning: a rule will be discussed later on, that artillery should never retire unless ordered to do so by the Officer commanding the troops. If on his own initiative an Officer commanding artillery does retire without orders, he is responsible, and it rests with him to prove that his knowledge of the surrounding circumstances was sufficient to convince him that no harm to the other troops and the tactical plans would ensue from his action, and that it was right; but, if he receives no orders to retire, and standing his ground loses his guns, then not he, but the Officer commanding the troops, is responsible for the loss. You will admit that a clear understanding on such a question is very desirable, indeed that it is absolutely necessary to secure a sure basis for combined tactics.

The tactics of artillery have a triple foundation.

Firstly, its position in relation to the infantry.

Secondly, the power of its guns.

Thirdly, the nature of its duties in the succeeding phases of the combat.

1. The keystone of all its tactics is contained in a full recognition of the fact that *artillery is purely an auxiliary to infantry*, which is the arm that must finally decide every battle. The object of artillery is to save infantry loss.

No doubt the infantry will find its advantage in allowing the artillery to play the principal *rôle* in the earlier parts of an engagement, and in as far as possible arranging its own deployment so as not to interfere with the fire of the guns. This has led to the assertion by some that they are sister arms of equal importance, and that each should equally conform to the requirements of the other; but, although it may be taken as true that infantry cannot fight a modern battle without artillery, it is still truer that every action of the latter depends on the requirements of the former.

For instance:—a superior artillery can generally in time, with little loss to itself, silence its opponent's guns at long ranges; but every moment the struggle is prolonged after the deployment has been made, and the infantry stands ready to advance, is a gain to the defence; therefore on the offensive the artillery must advance to such ranges as shall enable it to gain the mastery in such time as will not entail delay in commencing the infantry combat.

2. The power of the guns consists in their range, the effects of their ammunition, and the means provided for aiming them; modified in a constant degree by the gunners' skill in shooting and in fire tactics, and in a varying degree by the circumstances of ground and atmosphere.

The batteries of our 1st Army Corps are now armed with a 12½-pr. B.L. gun. Its range table extends to 6,000 yards, at which distance an elevation of 15° 30′ is required, and the shell descends at an angle of 27° 25′ with a velocity of 628 f.s. The common shell has a bursting charge of 1 lb. 8 oz., which is 3 oz. more than the 32-pr. spherical shell contained. Fifty per cent. of the shots will at 3,600 yards hit a company of 40 files advancing in fours, and at 3,000 yards the same percentage will hit a single gun advancing towards the battery. The shrapnel shell, containing 177 bullets, can be fired with time fuzes effectively up to 3,000 yards, and even at 6,000 yards the remaining velocity is sufficient to render it capable of some effect, though at present we have not got a time-fuze which burns for a sufficient duration. At all ranges the results obtained at experimental practice, compared with those of the shrapnel of the 9-pr. and 16-pr. R.M.L. guns, show that in calculating the influence of the arm in battle a totally fresh set of coefficients must be used; for apart from the length of range, high velocities and the consequent low trajectories, assisted by the construction of the latest pattern shell, have given artillery an immense increase of power, both because the amount of lead in the shape of bullets is greater, while the "dangerous zone" is deeper, and also because at ranges, at which rapidity of fire is important, very considerable effects can now be obtained from shrapnel shell with percussion fuzes, if the ground be only of moderate hardness and fairly level.

Each piece is provided with one of Scott's telescopic sights. These are believed to be the best in existence, and certainly remove the difficulty of seeing the target, which has hitherto prevented the full use in the field of the long-ranging powers of modern guns.

To improve our shooting we require more ammunition and a system of fire tactics. The latter, it is understood, is soon to be settled, and it is hoped thoroughly practised over land ranges *provided with all the necessary equipment.* Unless, however, Parliament provides the necessary funds for this object, we shall in this respect be inferior to more than one other nation. To shoot well is by far the most important object of artillery, and without it there can be no real efficiency.

Prince Hohenlohe says the German guns have a range table up to 7,700 yards, and that at that range 50 per cent. of the projectiles would fall in a road 15 paces wide, if a battery were firing down it. He considers that the effect of artillery fire becomes noticeable at 5,500 yards, but that no great results are obtained until shrapnel fire is effective. This he says commences at 3,000 yards, is decisive at 2,000 yards, and annihilating at 1,100 yards. At the same time he estimates that infantry fire begins to be felt at 1,700 yards, becomes important at 1,300 yards, decisive at 500 yards, annihilating at 300 yards.

From these figures (which need not alarm us as our 12-pr. has a M.V. of 1,710 f.s. and a R.V. at 5,000 yards of 660 f.s., while the German 12-pr. has a M.V. of 1,525 f.s. and a R.V. at 5,000 yards of 574 f.s.) he anticipates that, whereas actions have hitherto

been generally commenced by the skirmishers of the defence, now troops may often be compelled to commence their deployment, and their guns be obliged to open fire, long before the most advanced infantry come into contact. He thinks the artillery contest will *commence* at ranges between 5,500 and 4,500 yards.

This, he considers, favours the assailants, because in the deep zone, in which they can bring their batteries into action, the ground in ninety cases out of a hundred will afford opportunities of placing them in position unseen by the defenders; but at the same time he remarks that he has never known batteries prevented opening fire at ordinary ranges.

These figures also show, I think, that the position of the guns as opposed to small-arms has improved. Taking the ranges of small-arms and guns in the time of smooth-bores to have been 300 and 800 yards respectively, and admitting that small-arms have as much effect now at 1,500 yards; then, for a proportional advance the guns should be as effective at 4,000 yards. You will find that they are more so. The distance the infantry then had to cross after coming under effective artillery fire before they could reply effectively was only 500 yards, a matter of five or six minutes; now the distance is 2,500 yards, and cannot be crossed under half an hour. Of course the ground will generally favour the advance more between 4,000 yards and 1,500 yards than between 800 yards and 300 yards; but against that is to be put the immense increase of power artillery derives from the use of elongated projectiles and modern shrapnel shell.

Shrapnel fire has never yet been used in the field, with modern fuzes and modern high velocity guns, by any considerable body of artillery; when it has been, I think we shall find that many of our tactical ideas require radical revision.

3. The duties of artillery in a battle may be stated in the following order:—

On the Offensive.

(1.) To make the defenders discover their position, and to test their probable resistance.

(2.) To cover the deployment of its own infantry, and to silence the defender's guns.

(3.) To destroy the steadiness and to keep down the fire of the hostile infantry at the point of attack, and to encourage and support its own by advancing with it.

(4.) To complete the victory by its fire from the captured position, or to form a refuge, behind which the unsuccessful troops can reform.

On the Defensive.

(1.) To compel the assailants to deploy at a distance.
(2.) To disable the hostile guns.
(3.) To assist in repulsing the attack of the infantry.
(4.) To complete the victory, or cover the retreat.

Artillery clears the way, marks the progress, and is a rampart of defence in time of need.

We have, then, a triple foundation for our tactics: we have also three grand rules always to be observed.

1ST GRAND RULE. *All the guns are to be employed.*—There can be none kept in reserve. The first step towards success being the gaining of the predominance in artillery fire, the rule as far as the offensive is concerned has long been admitted, but some may still question it as regards the defensive. However, Prince Hohenlohe meets the possible objections thus:—If once the attack is allowed to gain any predominance, the guns in reserve will never be able to readjust the balance. That at the ranges of the artillery duel, which will be over 2,000 yards, the batteries can always limber up and move where required, so that the only reason for reserves (viz., to have a force in hand to meet unforeseen circumstances) which in the time of short-ranging guns affected artillery as well as the other arms, no longer applies. To the argument that there is some danger that after a battle no artillery will be left for another day, he points out that the guns themselves will not be disabled, and asserts that the winning side can replace the losses in men and horses from the ammunition columns. He claims that the danger is only an additional proof of the necessity of winning the first battle, and supports his views with instances from his own personal experiences.

The fact is, that artillery takes up so much room in the columns of march and requires so much transport and such heavy supplies, that a gun not used is an unjustifiable encumbrance.

2ND GRAND RULE. *Some guns must advance alongside the infantry.*—They must keep fairly close to them through all stages of their combat. Indeed, in some cases, such as after a position has been captured and while the victorious troops are re-forming, the advanced batteries should push on into the skirmishing line itself.

You may ask, when guns have such power at long ranges, is it necessary or desirable to push them into the zone of infantry fire? Is it possible for them to exist in it?

The answers are:—It is necessary, because at the ordinary artillery ranges it would be often impossible to distinguish friends from foes, and when they get close, the risks attendant on over-head fire are too great, while an entire cessation of fire is inadmissible on account of its moral effect. Moreover, artillery is always required to assist in holding a captured position against the defenders' reserves, and to be of use must arrive in time.

The advance of some guns is also desirable, because, firstly, nothing is so sure a sign that ground has been gained as its occupation by guns, and therefore nothing is so encouraging to hotly engaged troops; and, secondly, nothing can produce a greater moral effect on the troops attacked than to have batteries advancing and opening fire on them at close ranges: to find themselves charged, so to speak, by artillery.

The possibility of guns advancing with the infantry has often been

practically proved. It is probably due to the mass of the fire, when the infantry is engaged, being concentrated on that arm, and to the volume of smoke being great.

Prince Hohenlohe, too, writes:—"How can you expect a gunner to watch his comrades of the infantry charge in at the last and hottest crisis, without longing to be with them? * * * * Hold to your rule, if you please, that artillery is to shun the zone of infantry fire. Some individuals may here and there take advantage of it, and feel themselves 'justified' by its provisions. But the man of courage will, at the critical moment, despise these rules. He will go forward and help, and will not ask what are the regulations. * * * * Even if cool reason says that artillery ought at such moments to remain in rear, the heart would drive it in. Artillery which goes straight against the front of an intact and strong line of infantry, and advances to within a few hundred yards of it, works with its heart but without its head, and would be annihilated. Artillery which leaves its infantry in the lurch, in its efforts to avoid the zone of infantry fire, shows plenty of head for its own interests, but no courage at all, and would be useless."

3RD GRAND RULE. *No gun is ever to be retired except by the order of the Officer in command of the force, i.e.*, of the Officer commanding the advanced guard or other independent body, the "Corps Division," or the Army Corps, as the case may be.

When pressed by the enemy, artillery will be unable to retire with safety, and its only salvation will be found in the continuance of its fire. If it retires, while it can still do so with safety, it may entirely upset the commander's calculations and will always discourage the other arms.

A gun must not be withdrawn to refit, for it is a visible sign of loss, and the refitment will be carried out much quicker in the line of battle.

A battery must not retire because it has no ammunition; ammunition wagons will find it more easily than it will find them. If a battery ceases firing, the enemy will turn his attention elsewhere, and, when ammunition arrives, the action will be recommenced more quickly and with less loss than if the advance to the position had to be made afresh.

Artillery must not retire because it is getting the worst of it; it should be reinforced. Its very losses prove that it is where required. But this does not preclude the commander of a force acting on the defensive (and therefore presumably the weaker) when he finds the assailant gaining the upper hand in the artillery duel, from placing some of his batteries under cover in order that they may act again at the commencement of the infantry attack.

I take the following from Prince Hohenlohe. "During our advance on Saint Privat, and during the artillery fight which followed against the enemy's guns on the hill of Saint Privat, my batteries suffered considerable loss from the enemy's shells, though by far the greater part of their heavy losses on this day must be ascribed to the Chassepôt fire. I saw some limbers blow up and many guns during

the cannonade lying miserably on the ground 'winged,' as we say, that is, with a broken wheel. But not one was withdrawn, the injured guns were always soon repaired by the aid of the wagons which stood very near them, so that after the battle I could not exactly tell how many guns had been put temporarily out of action. But when towards the evening it was necessary to support the infantry in their attack, everything had been so entirely repaired during the increasing cannonade that three guns only could not immediately be brought up and had to be left in rear. These guns would have been undoubtedly lost if we had retired instead of advancing. But if we had sent every gun which was put out of action back from the line of battle in order that it might refit, in that case perhaps a moment might have arisen during the battle when we should have had no guns in this position, in which case the battle would have been lost at this point. By keeping the guns which were out of action in the line of battle we ran the risk of losing three guns if we had been obliged to retire, but perhaps this was the very reason why we were able to hold our ground."

Again he writes:—"Moreover artillery must never retire while a hostile attack is advancing against it. This is the most favourable time for good effect of fire. If the artillery has been ordered to retire, it must for this purpose take advantage of the pause which will ensue when the assailant has been stopped by its fire, and is wavering until he shall be ready to push forward again when he has been reinforced by fresh troops. But if the artillery receives too late the order from the General to retire (and without such an order it must not retire), so that it cannot withdraw quietly and in order, in that case it must give up all idea of falling back, and it cannot be blamed if it loses its guns. It is better in this case to go on gloriously firing, than to allow itself to be captured flying."

To these three grand rules I am tempted to add a fourth, because, although it more properly belongs to tactics purely artillery, the other branches may offer some opposition to its execution, if the reason for it be not known to them. *The wagons of a battery must never be separated from it on the march.* The guns commence the action and are wanted to the very end. They must keep their limbers full for use after any rapid advance on the battle-field when the wagons belonging to the fighting line may get left behind. If the wagons do not march with the guns there is a risk of their not being able to find their battery in action and even of their being mistaken for train and made to give way to other troops. The ammunition columns, too, are an essential part of the fighting force, and all other train must give way to them.

Such are the principles. I will now endeavour to illustrate their application, and will take—

Offensive Tactics

first, as the initiative is always the easier form of action.

The artillery commences the fight, so must be near the heads of

the columns. As it requires protection when limbered up and can seldom be pushed on into action without a certain number of covering troops, it may be taken as a good general *aide-mémoire*, that it will march in rear of the first unit of the main body of the force to which it is attached: for example, the battery of a small advanced guard behind the first battalion of its main body; a divisional "group" behind the first brigade of its Division; the Corps Artillery behind the leading "Corps Division."

I give this as an *aide-mémoire*, not as a "rule," for there can be no fixed law in the application of tactics. For instance, in this case: In a much enclosed country deployments will have to be made along lateral communications, and the ranges will generally be short. Therefore most of the artillery will not be so near the head of the column, firstly, because confusion and loss of time will occur if the guns have to retire to reach a lateral road, and, secondly, because at short ranges it is difficult to withdraw guns once engaged. and the necessity arises of guarding against committing them to any decided line of action until the plans of the attack are formed.

The batteries on roads will generally march in "column of route," each wagon behind its gun; but when it is possible to leave the road to the infantry and to march alongside, "column of divisions," two guns abreast, or "column of subdivisions," each wagon alongside of its gun, will be handier. Under fire when moving to a flank, "column of route" is nearly always the safest, or if room be wanting "column of subdivisions" may be used.

Circumstances will decide whether a battery or a "group" shall be given to the advanced guard; but on no account should less than a battery be sent, and it should not be broken up for distribution amongst the van and main body. Two guns with the van might under favourable circumstances find the range before the arrival of the other four, but they would also show the enemy where to aim.

The Officer commanding the artillery of the advanced guard will ride with its commander, and will receive from him orders as to the position the guns shall occupy, and what is wanted of them. From the nature of things the position will generally be close to the road, and should be on that side of it where the fire is less likely to be masked by the advance of the other arms. Having received his orders, the Officer Commanding the Artillery joins his guns, takes them into action and remains with them.

It rests with the advanced guard commander to protect the flanks of the guns, and to send orders for them to advance, if the ground in front is not in the possession of his own troops; when it is, the Officer Commanding the Artillery may advance without orders, if he considers he can carry out the design better by doing so, and is sure that it will not force the action more than is desired.

It may be remarked that all our field days, from the small amount of troops available, partake of the nature of advanced guard engagements.

After the advanced guard guns have been engaged a short time (about ten minutes with the order of march given in Home's "Précis

of Modern Tactics "), the commander of the leading "Corps Division" will arrive. He will inform the Lieutenant-Colonel commanding the divisional "group" whereabouts he wishes the other batteries to come into action, and, as far as possible, what his plans are, especially on which flank he intends to deploy.

The Lieutenant-Colonel will choose the sites for the batteries, and send his Adjutant to bring them up. When the batteries arrive, the Lieutenant-Colonel will join them and remain with them. He now ceases to act as a member of the divisional staff, and assumes the position of a Brigadier.

The General of the "Corps Division" will also decide whether the advanced guard is to act on a flank or play any other semi-independent *rôle*, in which it will require its artillery, or if it is to be absorbed in the Division, in which case he will order the guns of the advanced guard to join those under the Lieutenant-Colonel; but, without such order they will remain at the disposal of the advanced guard commander. In any case the guns of the advanced guard will not join the others until they are established in action, as their fire will be required to cover the advance into position.

At this stage of the action the artillery cannot have much independence, as its advance or movement to a flank might easily interfere with the deployment, bring on the action too quickly, or make it of too decided a character. Consequently the Lieutenant-Colonel of artillery will generally ask for permission to move, if he considers any advantage may be gained by doing so, and will seldom be justified in moving on his own responsibility.

Assuming the Corps Artillery marches in rear of the leading "Corps Division," it will be the next to arrive. The Colonel commanding will ascertain from the senior Officer on the spot what are his plans and wishes, and will then instruct his Lieutenant-Colonels of "groups" as to which flank they shall deploy on and the whereabouts of their positions. The Lieutenant-Colonels will choose the sites and direct their batteries on to them. The positions should generally be more advanced than those of the "group" of the leading "Corps Division."

The Brigadier-General of Artillery will arrive on the ground with the Army Corps Commander, and will be with him while he consults the Officer who has been directing the operations previous to his arrival.

Up to this time the engagement will generally have been of a delaying character, mostly carried on by the guns at ranges well over 3,000 yards, and the actions of the various bodies of troops will have been more or less disconnected.

When the Corps Commander decides to attack, he will send orders to the Generals of Divisions to place their "groups" at the disposal of the General Officer Commanding the Artillery, for the artillery duel; but the Generals of Divisions in rear will usually anticipate the order by sending their "groups" forward as soon as it is evident a serious action has begun. The longer time the artillery has for the preparation of the infantry attack, the less will be the loss of that arm.

As soon as the order has been given, and he has learnt the Corps Commander's intentions and wishes, the General Officer Commanding the Artillery quits the staff and assumes the position of a "General of Division," which he retains to the end of the battle. The first thing he does is to choose his own station on the ground, of which he informs all "group" commanders, at the same time ascertaining from them the objects and purposes of their fire. He then forms his plans for the artillery contest, distributing the fire of the various "groups," and giving directions to those coming into action and those already there, so that when the infantry combat commences they may be so arranged as to best carry out their respective duties, which have been briefly described in explaining the distribution of the artillery of a corps. In short, he has to prevent confusion and wasteful dispersion or concentration of power, and to make the whole of the artillery work with one mind—his own.

This is the only true form of concentration. The terms "massing of guns" and "concentration of fire," so often used, are as often misleading and deceptive. The ground scarcely ever will admit of many batteries being placed in one continuous line, and intervals between the "groups" are necessary to prevent confusion and for purposes of command. Intervals between batteries, too, when there is sufficient space to allow of them, greatly facilitate observation of the effects of fire. The intervals between "groups" are also desirable, because although well-served artillery is impregnable against a regular frontal attack, and may be used with safety to fill up gaps in the general line, still some of the guns may occasionally be "rushed" by troops concealed in folds of the ground or by other cover, and the intervals afford facilities for bringing up into line supports of other arms. Moreover, the concentration of all the fire on one point and the total neglect of others is impossible in most cases, and seldom necessary. What is required is a due distribution of fire according to the needs of the moment as the battle progresses.

To effect this control the General Officer Commanding the Artillery will have to depend on the clearness and simplicity of his directions, and the intelligence of his "group" commanders, and on the good organization of his means of communication. Visual signalling does not appear to give promise of ever being successful in the actual line of battle, and although the field telegraph may attain great rapidity in its installation, it can never be accorded much confidence until it has been thoroughly proved by exercise with large bodies of artillery; therefore it is safe to assume that all messages will have to be conveyed by "gallopers." This certainly is an argument in favour of keeping the line of guns as short as the circumstances and the allowance of suitable intervals will admit, but not one strong enough to justify the entire elimination of the intervals, which can only be justified by want of room combined with a necessity of reinforcing the line.

For the commencement of the artillery duel 3,000 yards is at present a good range, though if an efficient time fuze were provided a really effective fire in many cases could be carried on up to at least 4,000

yards. But if the effect produced is not sufficient to guarantee the duel being over by the time the infantry is ready to attack, then at all risks the guns must be pushed forward to such ranges as will enable them to gain the predominance in the time available.

There is not much to be said about the positions for artillery acting offensively, for as a rule just what the ground gives at the practical ranges of the moment must be taken. Natural cover that will conceal the advance and make the position indistinct is always advantageous, but care should be taken that the ground does not slope so much to the rear as to make the recoil great, because "running up" the guns after each round will soon exhaust the detachments. If the choice has to be made, the teams should be covered in preference to the guns. Facilities for retreat are unimportant, for a position can be quitted by its entrance. The essential things for an Officer assigning positions to his artillery to remember are—

1. The targets must be clearly seen.
2. The ground must facilitate an advance to closer ranges.
3. The deployment of the infantry should not be hampered.
4. The front must be sufficient for the number of guns.

When the infantry combat commences, it may be assumed that the guns of the attack have gained a decided predominance and are standing between 2,000 and 2,500 yards from the position, at which ranges a large part of them will be able to assist in the final preparation for the assault. The "groups" belonging to "Corps Divisions" making the attack will now be sent to rejoin and to accompany them to closer ranges. They will endeavour to at once come into action at not more than 1,600 yards, to ensure their shrapnel fire being of an overwhelming character. At the same time, if circumstances permit, the horse artillery "group" of the Corps Artillery may be sent to the outer flank of the attack so as to be in a good position to commence the pursuit.

These movements, however, are niceties of tactics that facts will very often render impossible of execution. The enemy has to be defeated, and the attacking infantry has to be spared loss as much as possible. For this purpose the artillery fire must be destructive and therefore the ranges as short as they can be. Some of the guns will be most useful remaining in the final position of the artillery duel, and maintaining the effect gained by a steady fire; the rest go into the fight.

If the assault be successful, guns will be wanted at once to secure the captured position. If the assault fail, then the artillery will form the breastwork, behind which the beaten infantry can rally. In the latter case, it will be too late to withdraw the guns; their safety will lie in the continuance of their own fire and the arrival of reinforcements.

The choice of position is of primary importance in—

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because by a good disposition of the guns it will generally be possible

for the defence to control the direction of the attack, at any rate for a considerable portion of the battle. It is of even greater importance now than formerly, because the long ranges of the guns render manœuvring unnecessary, if their positions are well chosen; and it is just the absence of movement on its part which gives the artillery of the defence an advantage over that of the attack.

Command of the ground, on which the assailant's guns will have to stand and over which their infantry will have to advance, is the chief requirement. The sites should admit of an advance to the front, and facilities for retirement are necessary when the action is of a purely delaying or rear-guard character.

Unless there is time to render emplacements invisible and to provide platforms, I do not believe in placing field guns in gun-pits or immediately behind epaulments, as it will hamper the handling of them and define their position. A slight bank or hedge, real or artificial, some 50 yards or so in front of the muzzles will be found more deceptive and effectual.

Cover for the teams is far more important than for the guns, but must be sufficiently near the batteries to prevent the supply of the ammunition becoming too fatiguing to the men. Cover affording concealment a short distance behind the position is desirable to give temporary refuge when the attack gains the predominance in the artillery duel.

At first, some of the batteries will have to be with the outposts, so placed as to sweep the lines of approach at the long ranges of their guns, for the advantages gained by compelling a distant deployment are too great to be ever neglected; but the greater part should be in positions commanding those which the attacking guns will have to occupy for the decisive stage of the artillery duel, at ranges between 3,000 and 2,000 yards.

That the doctrine of the indivisibility of the battery holds good with regard to the artillery of the outposts, unless the circumstances are very exceptional, and that its regular position is with the reserve, must be noted here, because the enclosed nature of the country, in which we generally have to practise, not infrequently offers temptation to break the rule.

Circumstances will determine the relative positions of the artillery and infantry in the general line of battle, but Prince Hohenlohe thinks it will be desirable, when possible, for the former to be 500 yards in rear of a line of advanced posts or skirmishers, fixing that distance as being the least at which the advanced line can be fired over with safety and sufficient to keep the assailant's skirmishers at least 1,000 yards from the guns.

As the flanks of the line are usually the vulnerable points, and the value of "oblique fire" is far greater than that of "direct fire," the "groups" and even the batteries will be further apart when acting on the defensive than when on the offensive, and can be so without disadvantage, as previous arrangements, field telegraphs, &c., will assist in the concentration of purpose.

The "groups" will be with their own "Corps Divisions," when

the latter are in the front line of battle, but those of "Corps Divisions" in reserve will be brought into line where most required; generally alongside the Corps Artillery, which will be so placed as to command the most likely situation of the mass of the assailant's guns.

As on the offensive, Lieutenant-Colonels leave the divisional staffs when their "groups" open fire, and the Corps Commander places all the artillery under the General Officer Commanding the Artillery as soon as it is evident that a serious attack will be made; but until he gives the order, the Generals of "Corps Divisions" are responsible for the positions of their batteries and that fire is not opened prematurely; although to ensure concerted action, the General Officer Commanding the Artillery will as a rule be placed in communication with them.

If the defence has the best of the artillery duel, all is plain sailing. The "groups" of the "Corps Divisions" destined to advance are again placed at their disposal, while the horse artillery "group" of the Corps Artillery is sent to act with the cavalry. The General Officer Commanding the Artillery with the rest of the guns prevents the artillery contest being reopened, and assists in holding in check the feint which the assailant's infantry will make to cover their withdrawal.

But when the assailant's guns appear to be gaining the predominance, the General Officer Commanding the Artillery has a most difficult problem to solve and great responsibility. He has to decide whether it may be possible to regain the superiority by a fresh arrangement of his batteries or of their fire, or whether he must report to the Corps Commander that the enemy is too strong for him. If the decision is put off too long, there is every chance that the power of withdrawing from the field without a large expenditure of life and a loss of guns will have passed away.

When the Corps Commander knows that his artillery is being overcome, he will have at once to decide whether to stand his ground or to retire. If he decides to retire, he must remember that the batteries, at least the greater part of them, should be withdrawn to fresh positions before the enemy's infantry commences its attack; once the effective rifle fire has begun, it will be too late. If he decides to stand his ground, he may preserve some of his batteries for the final struggle by causing them to cease firing and to withdraw a little distance; but some must always be left in line to prevent the infantry being discouraged by the cessation of fire and to save it loss by attracting the fire of the enemy.

In the final combat, guns must at all risks to themselves turn the whole of their fire on the infantry, and success will largely depend on the gunners having been taught and remembering that the nearer the enemy approaches, the more efficacious will be their own fire, and that its efficacy will increase far more rapidly than that of the rifle-fire of the assailants. Guns well and steadily served are impregnable against a frontal attack, and nobody has a right to withdraw a single gun without the orders of the Commander of the troops.

Both on the offensive and defensive, if cavalry does not receive a distinct *rôle*, it sends its guns into the general line to assist in the artillery duel under the General Officer Commanding the Artillery.

To sum up—I ask your consideration of the following principles for handling field artillery.

I. *The battery of six guns is the fire unit*, and want of room is the sole admissible excuse for dividing it.

II. The normal unit of manœuvre is the "group," or in official language the "Division," composed of two or three batteries.

III. The sole aim of artillery is to support the other arms; saving them from loss by weakening the enemy and by attracting his fire, and encouraging them by its company in all phases of the battle.

IV. An Officer commanding a mixed force must give sufficient instructions to his artillery. He is responsible for its position relative to the other troops and for the general character of its tactics. The arm that has to prepare the way for the others cannot be left to conform to their movements. Without an active brain the limbs cannot co-operate.

V. All guns are to be used as soon as available. A gun out of action is a gun wasted and only an encumbrance.

VI. No gun can be retired without the sanction of the Officer commanding the troops. He alone can judge of the expediency.

VII. The ranges should be as short as circumstances permit. The nearer the gun is to its target, the surer it is to hit, and to hit is everything. But *in the earlier stages* of the combat too much risk of damage to mobility should not be incurred, and the advantages of the long-range fire of modern guns should not be forgotten.

VIII. The supply of ammunition must be ample, and it must be near at hand.

I plead my subject as my excuse. Artillery, it is true, is an auxiliary to the other arms, but to ensure the development of its great powers of help, study of its nature and its methods is necessary both on the part of those whom it helps and those who direct the whole. That its help is worth the trouble has been proved by the history of war; and, believe me, the day of artillery has not yet even attained its noon, it is still young.

The CHAIRMAN (Sir B. Walker): I hope this paper will lead to some discussion, and I would venture to repeat the wish Captain Johnson has so wisely put forth, that the discussion may not be confined only to members of his own branch, but that other branches of the Army will also give their remarks on the subject.

General Lord CHELMSFORD, G.C.B.: I think that we, who are members of the Council of the Institution, must congratulate ourselves on having this lecture delivered here by an Officer of our artillery, who has so thoroughly mastered the subject he has been discussing, and who has shown such a wide mind in his treatment of it. It often happens, I think, that those who belong to different arms are inclined to take a selfish view of any military question they are discussing, and are apt to consider their own arm exclusively, without any reference to the other arms with which they must always be associated. As an infantry Officer I entirely agree with Captain Johnson in what he has said, that artillery should be regarded as the auxiliary of infantry, and that that is its true *rôle*. I venture to assert that this

would not in the least weaken the position of artillery Officers. The general instructions that can alone be given to them must be left to them to carry out; and it will depend upon their ability, knowledge of ground, and their grasp of the powers of their special arm how this important *rôle* can best be carried out. This obligation will not hamper them in any way, or bring them down to an undue subordination to that arm which they are ordered to assist. I am very glad to see the importance which Captain Johnson attaches to the not breaking up of the tactical unit. I am afraid in our Army we are continually sinning against that rule, mostly because of the very limited space of our manœuvre ground, and also on account of the very moderate supply of troops which we usually have to manœuvre. It is a rule and principle, however, which ought to be observed throughout the Service. There is nobody who has been on active service but knows that if you once destroy the integrity of the tactical unit, you not only weaken the efficiency of that unit, but of the whole force of which it is a part. I think the lecturer is to be congratulated on having laid down so very clearly the three grand rules for the guidance of artillery on active service. I agree with him also with regard to his fourth rule, that is to say, of not keeping the ammunition wagons away from the gun. Those four grand rules put the subject, as it were, in a nutshell, and anybody that reads them carefully over and digests them, will be thoroughly well imbued with the manner in which artillery should be used on active service. In conclusion, I will say a few words upon some of the principles with which the lecturer concludes. I have already stated that the recognition of the battery as the fire unit is a most important point; and so is also the development of it, viz., that "the normal unit of manœuvre is the group." On that point I think it would be very desirable if our military authorities altered the word "division" as applied to artillery. It has been and always will be so long as it is used, a most confusing word as so applied. The third principle I certainly have no intention of controverting, but will support to the best of my ability, viz., that "the sole aim of artillery is to support the other arms, saving them from loss, &c." The fourth is that an "Officer commanding a mixed force must give sufficient instructions to his artillery." An artillery Officer, as I have already said, would not be unduly fettered by receiving these instructions. He must know what the corps commander is going to do, how he is going to work his infantry, and what is his objective point, otherwise it would be perfectly impossible for him to place his guns in such a position as to give the best assistance he can to the attack. Then "all guns are to be used as soon as available." That, I think, is a good principle, but I will leave it to artillery Officers to discuss; they may have something to say on the subject. The sixth is, that "no gun can be retired without the sanction of the Officer commanding the troops." That is perfectly sound, and I think the way in which Captain Johnson has handled the argument, and shown what is the responsibility of the Officer in separate command, is extremely good. There is no doubt when an Officer is placed in a certain position by a superior Officer he is intended to stop there; if he does retire it is on his own responsibility, and he must show good reason for it. An Officer will no doubt often have to exercise this responsibility, but he must understand he takes it at his own risk, and he must be enabled to explain to his superior Officer why he did so. He should never be blamed, and never would be blamed by any commander of troops, if by remaining he lost his gun. It has been too much a bugbear to the artillery—and I am glad Captain Johnson has brought that point out—that it is a disgrace to them to lose their guns. The disgrace is in not employing them properly, never in losing them after having fought them to the last.

Major Sisson Pratt, R.A.: The lecturer has stated that his arguments are founded mainly on the views of Von Schell and Prince Hohenlohe. The views of those celebrated authorities were officially recommended to the notice of artillery Officers as far back as 1883, and consequently are not new to many of us. In reading Von Schell some years ago, the first thing that struck me was that his system of command was so very complicated. The duties of Lieutenant-Colonels of Divisions, Colonels and Brigadiers of Artillery, are intermixed with those of infantry, Generals of Divisions and Army Corps, so that even in the silence of the study it is very difficult to follow the different relations between these commanders. Whatever it may be in the German Service, this system of command is too com-

plicated for our own, where we have very little experience in dealing with large bodies of troops. Captain Johnson refers to the battery as the fire unit. Von Schell and several writers in the last few years seem to have directed their attention to showing that the fire of the group should by some means of messages, signals, and so on, be concentrated in the hand of one man, the leader of the "group," as it is called. Now it seems to me that to put down the division as a manœuvring unit, and the battery as a fire unit, is liable to lead to a little confusion. It would be better to say that that the division is both the manœuvring and fire unit, or that the battery is, and probably most of us would agree that in our Service it would be better to assume that the battery is a unit which may be grouped for either fire or manœuvring purposes as occasion warrants. With regard to the other authority, Hohenlohe, it is well known he took a very important part in the wars of 1866 and 1870, and that he published a pamphlet which it is not an exaggeration to say, forms the foundation of modern artillery tactics. The letters of Prince Hohenlohe, referred to by the lecturer, were written one or two years back, and I think if you compare them with his original pamphlet you will find that they are simply an elaboration of it; they give most interesting personal experience in the wars of 1866 and 1870, but they simply confirm what is stated in the original pamphlet. There is one point of difference, however, that the distances at which artillery should come into action have been very much increased. That has naturally resulted from the new German field gun of the 1873 type being much more powerful than that used in the previous wars, and also from the fact that the Germans, since the war of 1870, have gone in very largely for the use of shrapnel, which it is well known was scarcely employed at all in the Austro-Prussian or Franco-German War. If you compare the two pamphlets you will see, roughly speaking, that Prince Hohenlohe now advises coming into action under various conditions, about 500 yards further off than he previously recommended. On one or two occasions he refers to the necessity of artillery coming into action at very long ranges. This question is probably one on which there is some difference of opinion, but there is a very good rule, I do not know who it was made by, that artillery should never fire at such ranges that they cannot see the effect of their shell. Prince Hohenlohe, in 1885, in referring to the opinions he formerly expressed, speaks with the very highest authority as to what he has actually seen—he speaks, we may say, *ex cathedrâ*—but when we come to the question of very long-range fire, his views are not so decided, and we may be allowed to criticize them, taking them rather in the light of "pious opinions."

Lieutenant-General Sir ROBERT HUME: Captain Johnson not only required no excuse for the lecture that he has been so good as to give us, but he deserves every praise for the pains that he has taken to get the facts together that he has laid before us. I entirely agree with what Lord Chelmsford said as to the good that it does all of us who are not artillerists, especially, I may say, old Officers who have risen to the rank of General Officers, and who have to deal with every arm of the Service, how much good it does us to have an opportunity of hearing such a lecture as we have heard to-day, and to be able to take part in the discussion that follows it. There is no doubt, Sir, that to many of us who through circumstances over which we have no control are not able to take part in the active work of the Army, at the present moment it is a great thing indeed, and a great benefit, to be able to hear such papers as we have heard to-day, and to find laid before us in a concise form what otherwise would take up so much time, and perhaps we never could have the opportunity of hearing. With regard to what Captain Johnson has laid much stress on, the fact of artillery being looked upon merely or entirely as an auxiliary arm, he also spoke of the—I think he made use of the expression, "damaging exclusiveness," that has sometimes been found to exist in his own branch. I can only say that in my own experience, which is pretty long now, I have never in any rank in which I have been, but especially since I have been a General Officer, and have had an opportunity of having a body of artillery under my command, I have never met with anything except the most cordial and intelligent co-operation from artillery Officers of all ranks, and especially those of high rank, who have been placed in command of bodies of artillery acting in connection with other arms. I have always found in the artillery that which I think you will all agree with me

is a thing to be fostered, not only in the artillery, but in every branch of the Service, I have found in the artillery everywhere, on service or in camp or quarters, the most admirable *esprit de corps*. I have found the artillery never satisfied unless they do whatever work they have to do not only in cordial co-operation but to the best of their ability. I have made this observation simply because Captain Johnson has laid much stress on it himself, or else I would not have spoken about it, but it seemed to me in my position it was well that I should do so. With regard to the actual subject before us, the handling of the artillery of an Army Corps, I think there can be no doubt, supposing the Army Corps to be going into action, that the first object must be to get your artillery, as far as possible, every available gun, into action as soon as possible, and in order to ensure that, I would say one of the primary duties of the Officer commanding an Army Corps would be to see as far as possible that the disposition of his corps was such as to facilitate the movement of all his artillery to the front as soon as possible. With regard to another point which Captain Johnson spoke of, which is the impregnability of artillery to any frontal attack, I am not so clear. I should imagine that of course a great deal would depend on the actual composition of the force of artillery that was so attacked, and if the attack were frontal it would still be well, if possible, that with the artillery should be either some of the quick-firing guns of which we heard a description this day week, or perhaps some of the machine-guns, but I do not know. I have had no opportunity of seeing these things, and that of course would be a matter for people to examine into in detail. I understand Captain Johnson to say he considers, and of course it is mentioned in Prince Kraft's lectures, but not from his own observation—I think it was from Von Dreskiz—I understand that what Captain Johnson lays down is that artillery may feel satisfied that they are safe from any frontal attack, that is, artillery as at present constituted. I hope they are, but I think it is a point I would not trust too much to. I do not know of any other points that I can speak about now, but no doubt we shall have them spoken to by other Officers.

Major NEVILLE WALFORD, R.A.: I suppose, Sir, the object of one's getting up is, I presume, to criticize, and therefore I will refrain from saying a great deal that might be said in commendation of this lecture. There are one or two points, however, that I should like to remark on. First of all Captain Johnson mentioned the use of a shrapnel with percussion fuzes. Perhaps this is a rather too technical question to enter into here, but I may say that with the single exception of shrapnel with percussion fuzes against cavalry they very rarely have much effect. Perhaps at short ranges if burst close up to infantry they might tell, but at anything like a long range used against infantry, who would probably be lying down under cover, I do not think the percussion fuze would give very satisfactory results. With reference to Captain Johnson's statement as to the advance of artillery alongside the infantry, I think that is perhaps rather an exaggeration of what Prince Kraft says, which is, I think, that they may accompany the infantry; this I do not understand quite to suggest that they should move in the same line. I think if the artillery did advance alongside the infantry they would be rather in the way. It must be remembered that the infantry are constantly moving, and if the artillery kept alongside of them it would imply that they were not firing.

Captain JOHNSON: I meant they move forward with them; they do not remain in their own position.

Major WALFORD: What I would like to see would be that the Officer commanding a group or division should move forward with the infantry, select a position for his guns, and bring them up as near the infantry as he can. I should not wish by that to say that in my opinion the close action of individual batteries would be undesirable. I think there would be many crises in the action in which batteries cannot be pushed too close in, and I think it is now pretty nearly accepted as an axiom that wherever a battery can go it can fight; that is to say, if a battery can move within the zone of infantry fire it will be able to fight there; perhaps it will not be able to get out again, but that is the business of the infantry. With regard to the guns of the defence, Captain Johnson said something with regard to the defensive force retiring out of position, and proposed, I thought, to withdraw a portion of the guns in order to take up a position in rear. I did not quite under-

stand what is to become of the remainder, but as far as I can make out his intention was that the whole of the guns of the defence at some time or other should systematically retire, by échelon of course, but still that the general movement of artillery of a defensive force which is preparing to retreat should be that of retiring. I think that is entirely opposed to the modern principles of the German Army. Of course that may not be absolutely right, but I think they hold that the one occasion on which artillery may be distinctly ordered to hold its ground at all risk is when acting on the defensive when your army is called upon to retire; and I think on the face of it that has a good deal of common sense. Prince Kraft remarks that everyone sees the movement of a battery or line of batteries. Everyone within half a mile will thus see them retire, and the moral effect must be bad. In spite of what has been said by Sir Robert Hume, I still confess—though probably I am prejudiced as a gunner—that I do believe that the front of a line of artillery which is properly worked is absolutely impregnable provided there is open ground before them. Another point I wish to remark on is with regard to something Major Pratt said. He was speaking about the question of long ranges for artillery. I do not think, judging from what I have seen, that the actual range of the gun is any test whatever of the long range of artillery. I think it might be accepted as an axiom that the range of artillery is limited not by the distance to which the projectile can be thrown, but absolutely by the distance at which, owing to the circumstances of weather and so on, the fire can be observed. The main essence of artillery fire is the power of observation, and it is obvious that would vary with the country, the weather, and the target; so I do not think any distances ought ever to be laid down for different phases of artillery action except perhaps for very close action. There was one point, I think, Captain Johnson omitted, though perhaps it was not sufficiently connected with other arms to be suitable to his lecture; that is, the absolute necessity of scouts being sent out on the flanks of batteries, especially at the early stages of an action. I was at the French manœuvres last year, and there I saw a battery come into action about 100 yards from a village in a field surrounded by a stone wall. It had not fired two rounds before two companies of the enemy came out of the village and captured it. That was a very good case in point, and no doubt there were many occasions in the war of 1870 in which batteries ran considerable risks by coming into action near cover without having searched it. There is one other subject, which again is rather technical, *i.e.*, the character of the target against which artillery will have to fire in war; with the exception I believe of the target in the artillery duel, that is to say, individual guns, all targets of artillery in war will have a wide front. The rider I should attach to that would be that the direction of artillery practice is not of very much importance; the elevation is everything. I would also draw attention to the fact that, with the exception of this target in the artillery duel and the firing on villages and woods, all targets in the field will be moving. Up to the present time I am afraid we are a little deficient either in theory or practice in firing at moving targets, and that appears to me to be a point that ought to be very carefully worked out. There was one other matter to which I should like to refer. Major Pratt mentioned that he would like to see the battery accepted as the unit for firing and for movement—a tactical unit and a firing unit. I am sorry to say I am very strongly opposed to him there. The Lieutenant-Colonel's command is essentially the tactical unit of all nations, perhaps less in our Service that in any others, because we work as a rule with such a small force, no more principally than an advanced guard, as was mentioned just now, so that we come to look upon the battery as a perfect unit, whereas, as a matter of fact, the battery is a very small item indeed. I should like to see the Lieutenant-Colonel's command accepted by us as the tactical unit of artillery in action. But the actual conduct of the firing cannot be confided to a commander of a larger unit than a battery, as it is impossible for one man to supervise the firing of three batteries, if merely from the fact that they occupy a front of 300 yards at least. I may perhaps describe the artillery division as corresponding to the infantry battalion, while the battery corresponded to the section. That comparison, I think, would make the artillery units coincide more or less with the most modern units of infantry tactics.

Captain F. G. Stone, R.A.: With regard to the idea of exclusiveness which

Captain Johnson touched upon, although there might have been such a thing at one time I think it has now ceased to exist. Cordial co-operation between the artillery and other arms is most heartily desired as the only way by which we can hope to win battles in the future. With regard to what Major Walford said as to artillery advancing, I did not understand Captain Johnson in the same sense that he did. What I understood Captain Johnson to mean was that if artillery on the defensive is unable to assert its superiority, it is not the slightest use staying where it is, but it must seek a new position where it can assert its superiority. This does not necessarily imply retirement; the second or third position may not be in rear of the first one. Captain Johnson says the artillery must be regarded as merely the auxiliary of infantry. I must say I should like to make an amendment to that, and that is, that it has other duties to consider besides acting merely as the auxiliary of infantry which must not be lost sight of. There are several cases which time will not permit me to quote, in which artillery has acted by itself with success and in combination with cavalry, in which infantry has not even been on the field, and I think those cases should not be lost sight of, although of course in the main the use of artillery will be as an auxiliary to infantry. I may quote for instance the great Battle of Sedan, in which the battle was virtually decided by the artillery; and a small battle in which we suffered very heavily, that is, the Battle of Maiwand, in which the enemy's artillery most undoubtedly caused us to retire. Von Schell on this point remarks: "It is then the artillery which regulates the fight. It will be misunderstanding the whole value of that powerful arm to consider it merely as an auxiliary to the infantry." With regard to the summing-up—"The supply of ammunition must be ample, and it must be near at hand," I think it is the duty of every Officer to make a point of letting it be as widely known as possible that under the present system it is absolutely impossible that the supply of ammunition can be sufficient; and I think it is important to know that when we have sent the proposed two Army Corps on service, perhaps one to Europe and the other to help our troops in India, there will be fourteen batteries left, which it is proposed to break up into ammunition columns; when the country understands that the proposed organization of ammunition columns will leave our own shores without a single battery for home defence, it seems almost certain that these fourteen batteries will be retained at home. In any case the ammunition columns have no organization, except on paper.

Lieutenant-Colonel COLVILE: I am afraid the hope Captain Johnson has expressed that the nomenclature of the artillery may be changed is rather a hopeless one, for when we see the simple regimental numbers changed into long senseless territorial titles, I fear the tendency of the present day is not to simplify but to confuse. I trust it may be changed, but judging from the past there is little chance. I should like to ask for a little fuller explanation as to the extent to which it is proposed that artillery should be advanced "alongside of infantry." We are told that the fire of artillery is annihilating at 700 yards: well, it seems rather curious that when its fire is annihilating it should be called upon to advance any further: it could not do more than annihilate the enemy. It may be said that it could not fire over the heads of its own infantry unless it did, but at that distance its own infantry would be so close to the enemy's that it would be dangerous to fire. Therefore the chances are the artillery so advanced would not be firing at the front line of the enemy, but at the supports and reserves that are coming up; surely it could do that without moving forward. Then we are told the fire of infantry is annihilating at 300 yards; if infantry fire is annihilating at 300 yards, it would be very absurd to send the artillery within that range, yet if you do advance beyond 700 yards it is no use unless you advance a certain distance; you would have to advance say 400 yards, thus your artillery would according to your own showing instead of annihilating be annihilated. That appears to me to require a little more explanation. The second point I should like to remark upon is the suggestion that artillery should never be withdrawn except by the order of the Officer commanding the troops in the field, either the corps, or division, or advanced guard, or whatever the force may be; but I was under the impression that at the present day, in large battles, the extent of front covered was so great that it would be absolutely impossible for the Officer commanding the whole to see what was going on. We have been told that all this

immense amount of military instruction that is imparted at the present time, and which has disgusted so many, is given in order that we may be able to act and judge for ourselves under various circumstances; and yet we are now told that a battery of artillery commanded by a Major or Captain, as the case may be, is not to withdraw except by the order of the Officer commanding the whole. Therefore I confess to being at the present time a little mixed.

Captain JOHNSON: With regard to Major Pratt's remark about units, Major Walford has answered it. I agree with what Major Walford has said. Sir Robert Hume thinks it is doubtful whether artillery is impregnable against frontal attack. Well, it must be more or less a matter of opinion. Prince Hohenlohe[1] describes a case in the Battle of Gravelotte where a strong French column did attack his batteries, and he says that they were driven back, and that an Officer in the column acknowledged to him afterwards that it was the fire of the guns, and the fire of the guns alone, that drove the column back. But whether artillery is impregnable or not to frontal attack, I do not think artillery Officers would ever agree to the advisability of mixing up quick-firing or machine-guns in the same line with field guns. They are essentially infantry or cavalry weapons; they are not artillery weapons.[2] In the lecture I especially brought to your notice the necessity of intervals between the different groups, and I said that the intervals were desirable because it gave the opportunity of bringing supports of infantry up into the line of guns to prevent them being rushed by troops that approached close to them under cover. Major Walford said that percussion shrapnel is not very satisfactory except at very short ranges. I only said that the modern construction of the shells and high velocities gave an opportunity of using percussion shrapnel with some effect at ranges at which rapidity of fire was essential, and that must be at short ranges. The figures as to the effects of fire are not my own. I do not know whether they are correct or not. I only gave them as given by such an authority as Prince Hohenlohe, and in saying that artillery is to advance alongside the infantry I may have used a wrong expression. I did not mean to say they were to advance with the horses' heads dressed in line with the leading company; I simply meant that they should not remain in the position of the artillery duel. The artillery duel would be finished at over 2,000 yards, and it is necessary that the artillery should advance closer than that when the infantry advance, and the further it can go with the infantry the better. But of course I do not advocate going in to 300 yards. It is simply a matter of accident of the ground and accident of the moment as to how close you can get to the enemy's line without stopping. Probably the extent of your advance will be decided for you by the loss of your horses. You will have to stop to put the teams right. Major Walford misunderstood me about retiring batteries on the defence. I said that when the Officer commanding the force on the defence was told by his artillery commander that he was getting the worst of the artillery duel, and that his guns could not hold their own any longer, he then had to decide whether he intended to retire the whole of his force or to fight out the battle to the bitter end, and I said, or intended to say, that the batteries he wished to retire and not to sacrifice must be taken away from the line before the attacking infantry began its attack, *i.e.*, before they opened effective rifle fire. But I especially said that some of the batteries must be left in the line and must remain to the very end, whether they were lost or not: it is necessary to keep some of the batteries in line. I did not mean to say all the batteries were to be taken away. Major Walford drew attention to the necessity of flankers, and they are absolutely necessary, but there are no spare men in a battery to send out as flankers, and it rests with the Officer commanding the advanced guard or any other small force, the artillery of which might be placed in an exposed position, to protect that battery's flank. Captain Stone objected to calling the artillery simply an auxiliary to infantry, and he quoted a passage in which it was said it regulated the fight, but it regulates the fight in the interest of the infantry, it regulates the fight in such a way as will favour the attack of the infantry in the end. Colonel Colvile

[1] See "Walford's Translation," p. 38.

[2] At least that is my opinion of those actually in existence.

took exception to the rule that artillery was not to be retired except by order of the Officer commanding the force, and he said that an Officer commanding an Army Corps could not see what all his batteries were doing. Of course all rules have to be broken in the field; there is no rule that you can stick to absolutely. I only meant to say it was a very heavy responsibility for an Officer commanding artillery to retire his guns when he has been put in a position. The Officer commanding the whole ought not to put his guns in such a position that they should have to retire when he cannot say whether it is necessary or not. He may have put them in a position on purpose to hold that particular spot for him, and their retiring without his knowing anything of it might upset all his calculations entirely.[1]

Lieutenant-General Sir ROBERT HUME: May I be allowed to explain? I do not wish for one moment to advocate the use of machine-guns with artillery, because, of course, according to my idea, the machine-gun is, I should say, a weapon entirely to be used by infantry and cavalry. What I meant to draw attention to was, having last week's lecture very much in my mind, that it be worth consideration whether the Nordenfelt quick-firing gun might be used with artillery. Of course I should not put machine-guns in line with artillery.

The CHAIRMAN: I have had very peculiar pleasure in acceding to Captain Johnson's request that I should take the chair at this lecture, and that pleasure has been very largely enhanced by finding that so many of the speakers who have favoured us with their very valuable remarks are children of the Staff College during the time I held office. I think the Institution may congratulate itself very largely on finding that young Officers—I believe Captain Johnson has only seen ten or eleven years' service—really give thought, and valuable thought, to such a great question as he has handled to-day. I know hardly any question of the same importance. We hear from so many of the gentlemen of that noble corps, the Royal Artillery, who have spoken to us to-day, that anything like exclusiveness or jealousy between the Services is gone from us for ever. I am so old a soldier that I can remember the day when a good deal of that feeling existed, and also a good deal of exclusiveness and jealousy between cavalry and infantry, but I think the rough times of the Crimean War knocked a good deal of that nonsense out of us. I have had probably opportunities more than most of those present of seeing very large bodies of artillery employed in the field in combination. It is very difficult for us, considering that the extreme of our ambition is to put two Army Corps into the field, one of which as we heard to-day will most probably be employed in Europe and the other in Asia—it is very difficult for us to conceive the idea of great masses of artillery being employed, because manifestly one Army Corps fighting for itself could not employ the whole of its artillery in one great mass. Where, as I have seen, you have six or seven Army Corps in line of battle together, some of them of course in reserve and support, it is not so difficult to employ the whole artillery of an Army Corps in one great line, because most probably the flank on which that mass of artillery is not employed is protected and covered by the artillery of an Army Corps fighting next to it. I perfectly remember at the battle of Wörth, sitting behind what I never saw before, and certainly shall never see again, and that is a line of more than ninety guns, one line, the artillery of the 5th Army Corps, and I think two or three batteries, probably what Captain Johnson has called a group, which is best known by the German name of the Abtheilung, from the 11th Army Corps. But I also perfectly remember, as we are talking of artillery, what most impressed itself on me at the great battle of Königgratz, and that was the magnificent behaviour of the artillery of the Austrian Army. Long after the power of my eye or my glasses would enable me to see the Austrian infantry, and I think I may say their cavalry, disappearing in great clouds of dust in the distance, the Austrian artillery, self-sacrificing, covered the retirement of the rest of the army, and kept up an incessant fire. I think one of the most unfortunate ideas, which I feel from what has been said to-day from artillery Officers is now exploded, that

[1] If he cannot avoid giving such a position to any of his artillery then he should especially instruct the Officer commanding it as to the measures to be taken in case it shall be hard pressed.

ever hampered the action of artillery, was the dread of losing a gun or a battery. If artillery does what is required of it, there can be no disgrace in being overpowered, and I think the general feeling now is, that a man who fights his guns well, and then loses them in ensuring the safety of the great body of an army, or of that portion of the army which he is bound to protect, does not lose credit but gains great honour. There is always one point that is a little left out of view in laying down distances for the use of artillery, for they depend entirely upon ground. What may be a perfectly safe and perfectly effective position at one distance may not be equally so at another. I think the great mass of artillery which I spoke of at the battle of Wörth was firing at even a greater distance than has been generally spoken of to-day. The valley of the Sauer fell off from the side on which the Prussian Army advanced; there was a broad meadow certainly on one side of the river, because the other side was nearly under the cliffs, and then came the French position, and as well as I can remember with very inferior guns to those now in the possession certainly of the Prussians and of ourselves they were firing at comparatively very long distances indeed. Without having the map before me and measuring it off, I can hardly tell what that distance was. I entirely from my experience as a soldier agree with Captain Johnson's idea of the necessity of unity in command of the artillery, I do not mean to say that ninety guns—fifteen batteries—are to be moved by one man, but at any rate he is to indicate how and when so large a mass of artillery is to be broken up into smaller detachments, and the purposes for which those detachments shall be applied. I think we are very much indebted to Captain Johnson for his very able and very suggestive lecture, and as I said at the commencement of the few words I have thought it right to address to you, it is eminently satisfactory to this Institution to see Officers of his standing, and the standing of other Officers of artillery who have spoken, so ready to give their whole thought to the grand profession to which they belong. I trust, therefore, you will allow me, in the name of all present and of General Erskine as representing the Institution, to tender our very warm thanks to Captain Johnson for the great gratification which he has afforded us this afternoon.

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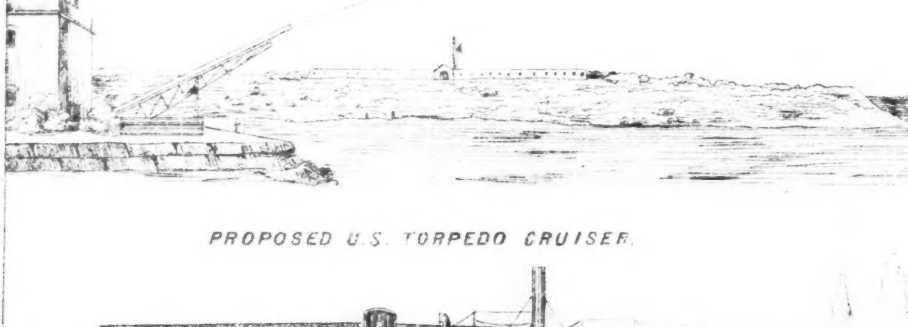
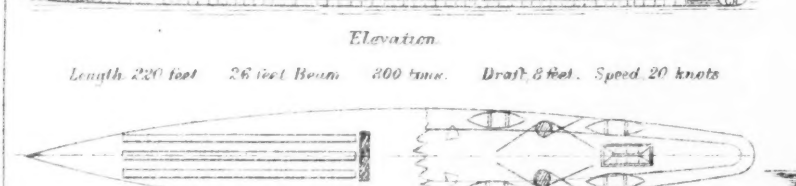


PROPOSED U.S. TORPEDO CRUISER.



Elevation.

Length 220 feet 26 feet Beam 300 tons. Draft 8 feet. Speed 20 knots

Plan.

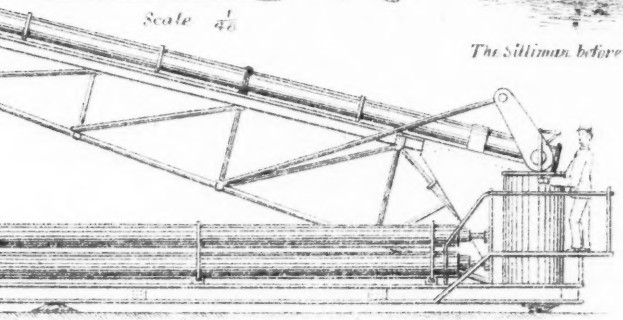
The second e

MITE GUN.

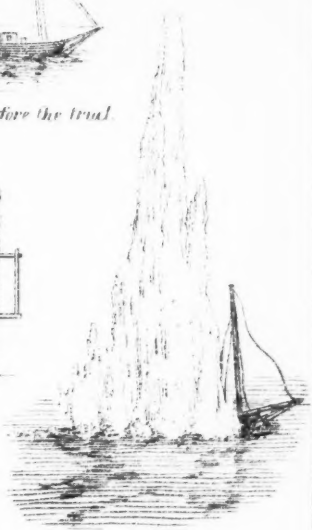
PROJECTILE

For the 8 inch Gun Carrying 100 lbs of Dynamite

Scale $\frac{1}{40}$



The Silliman before the trial.



The first explosion.

The second explosion.

The third explosion, in the air.

The wreck of the Silliman.

The fourth explosion.

...mpson & Sons, Cloth, 9, Marshall Lane W.C.

Friday, January 27, 1888.

ADMIRAL H. BOYS, Vice-Chairman of the Council, in the Chair.

THE PNEUMATIC DYNAMITE GUN.

By Captain H. DE H. HAIG, R.E.

THE problem of using dynamite, guncotton, or others of the high explosives in shells, has for some time occupied the attention of artillerists, but so far the attempts to throw such shells from guns, by means of the ordinary powder charges, have not been completely successful. Small charges of dynamite and guncotton, it is true, have been fired in projectiles, but usually such experiments have resulted in the premature explosion of the shell in the bore, and the consequent destruction of the gun.

The idea of propelling such shells by means of compressed air was first worked out by Mr. Mefford, of Ohio, United States, who constructed a gun for the purpose, and submitted it for trial by the Government, at Fort Lafayette, New York Harbour, in 1884. The task of experimenting with this weapon was intrusted to Lieutenant Zalinski, of the 5th Artillery, who improved and perfected it, and the projectiles in all their details, and whose name has hitherto been associated with the gun. This Officer showed me the guns and the results of his trials and experiments, and also gave me permission to make use of the information. The latest development is a 15-inch gun, now being constructed, which will throw shells containing 600 lbs. of blasting gelatine, equal to 900 lbs. of guncotton, at the rate of one per minute, with great accuracy, to a distance of two miles. The shells will act in either of two ways, they will explode on impact with any hard substance, or if they fall into the sea, they will fire after sinking 30 or 40 feet below the surface, acting as torpedoes against the most vulnerable part of a ship.

The gun which Mr. Mefford built and submitted for trial consisted of a brass tube, 28 feet long, only $\frac{1}{4}$ inch thick and with a bore of 2 inches. It was stiffened by a light trussed girder to keep it straight, and was pivoted at its centre on a tripod, about which it could move freely in any direction. There was a small reservoir for compressed air, which was simply joined to the breech of the gun by india-rubber hose. The firing valve was an ordinary stopcock turned by hand, and allowing a quantity of air to escape according to the judgment of the firer. The projectiles were made of brass tubing, with heavy conical heads and wooden bases, which fitted closely to

the bore to act as gas-checks. The shells were driven by a pressure of 500 lbs. on the square inch, and a range of 2,100 yards was obtained with an elevation of about 30 degrees, a somewhat surprising result for such crude appliances. Only a few shots could be fired at a time, because, as there was only one reservoir, the pressure fell rapidly and more air had to be pumped in.

The following conclusions were drawn from the results of the trials with this gun, viz.:—

1st. That to obtain accuracy of range, the air valve should automatically allow the passage of a uniform quantity of air at a fixed pressure.

2nd. The pressure should be much greater than 500 lbs.

3rd. That a steadier and stronger form of carriage was necessary.

With a view to correcting these faults, an experimental gun of 4 inches bore was designed and built. It was 40 feet long, of seamless brass tubing in three lengths, and $\frac{3}{16}$ inch thick throughout. It was like the original gun, smooth bore, stiffened by a T-girder, and mounted on a pivot under its centre of gravity. The firing valve allowed a uniform volume of air to pass each time it was opened, and it was found that thus great uniformity of range was obtained. The pressure in the bore was raised to 1,000 lbs., a very trifling amount in comparison to that obtained with powder, and necessitating very high angles of elevation.

Having obtained accuracy and considerable range, the next problem was to test to what extent high explosives could be fired with safety in the shells from this gun. At first, small quantities of explosive were used, and some air-space was left behind the projectile to act as a cushion and reduce the suddenness of the shock. Most of the known explosives have been fired in the shells without accident, but the best results, so far as necessarily rather limited experiments in this direction show, have been obtained with dynamite and blasting gelatine. The air-space was found to be unnecessary, and the projectiles are now placed close up to the firing valve. Unfortunately no experiments have been tried with greater pressures than 1,000 lbs., the results obtained with that pressure being considered sufficiently satisfactory, and the supply of money and guns being necessarily limited, as the invention is owned by a private company.

While experimenting to ascertain the best means of exploding his shells, Lieutenant Zalinski made the discovery that very much greater results were obtained when the charge was exploded from the rear than when the initial point of ignition was in front. This is explained by considering that the charge takes a short interval of time to explode, and when the initial point is in front, the remainder of the explosive is blown backwards by the gases first developed, and *vice versâ*. This was shown very conclusively by one series of experiments. A target composed of six iron plates, each 0·8 of an inch in thickness, making a total of 4·8 inches, was erected inside Fort Lafayette, and shells were fired at it from the air-gun at a distance of 60 yards, with an initial velocity of about 800 feet per second. The first shell was filled with sand

and weighed altogether 30 lbs. It penetrated three plates, or 2·4 inches. Then a shell charged with 20 lbs. of dynamite, but without a fuze, was fired, the intention being that it should explode by the force of the impact. Only one plate was penetrated, and the effect was considerably less than that of the blank shell. Another shell with a fuze at the point did but little more damage, but the last one, with an electric fuze at the base, broke through the whole of the target, and cracked and pulverized the wall behind.

The next difficulty was a satisfactory fuze, which would explode the shell whether it struck a ship, or fell into the sea.

The requirements were—

1st. Impossibility of a premature explosion in the bore of the gun.

2nd. Certainty of exploding the charge from the base of the shell on striking any hard substance.

3rd. Certainty of exploding the charge if the shell fell into the sea.

After a long series of experiments, Zalinski solved the problem by calling in the aid of electricity. He places two electric circuits in the shell, the motive power being small chloride of silver batteries. Either of these circuits, when closed and complete, will cause a current to pass through a detonating fuze in the base of the shell. The current burns a short piece of platinum wire, which sets off the detonating composition, and it in turn explodes the charge. These two circuits are kept open and incomplete until the right moment, thus: the first one has a gap in its circuit in the front of the shell, which cannot be closed before part of the contents of the shell moves forward, and this can only happen on its motion being suddenly arrested by some hard substance: the second circuit is complete, but the battery is dry, and there is consequently no current, sea-water penetrates through a hole in the shell, wets the cotton-wool and powdered acid in the cells of the battery, starting the current which fires the shell as described. As it is impossible for a current to pass through either of these circuits while the projectile is in the bore, or before it falls into the sea, or strikes something hard, the danger of a premature explosion is reduced to a minimun.

The results obtained with the 4-inch gun encouraged the designers to build one of double the calibre, to throw 100 lbs. of dynamite, and to have a range of about 2 miles. This gun was finished, and mounted at Fort Lafayette in the summer of 1885. It is 60 feet long, and consists of four lengths of wrought-iron tubing, and lined with a drawn brass tube, which are respectively $\frac{5}{8}$ and $\frac{1}{8}$ inch in thickness, making a total of only $\frac{3}{4}$ inch of metal. The gun is supported and stiffened like the older ones by a braced T-girder. The barrel is inserted into a cast-iron breech-piece which has two trunnions. These trunnions rest on hollow upright iron pillars, which stand on the rear end of a front-pivoting traversing platform, working on trucks and racers. The breech is closed by a hinged gate opening inwards towards the firing valve. The gun is elevated by forcing the stiffening girder upwards from the traversing platform, causing the gun to revolve about its trunnions. A cylinder worked by compressed air performs this operation on turning a wheel near

the breech. Another cylinder worked by the same power traverses by hauling on a wire rope, leading through a system of blocks attached to rings, to the right and left of the gun. The lever working the firing valve is brought to the left side, where are also the sights. Placed on the breech, conveniently for the firer, is a gauge showing the pressure of air in the reservoirs. A brass scale is also attached to the gun, giving the elevations required for all ranges, with all the air pressures that are likely to occur. After the gun is loaded, the operations of sighting, elevating, traversing, and firing are performed by one man. He estimates the distance of the object, reads the air pressure in the reservoir, takes the necessary elevation, adjusts his sights, lays the gun by bringing the compressed air to his aid, and fires by pressing the lever.

The air reservoirs consist of eight wrought-iron tubes on the traversing platform, with a total capacity of about 137 cubic feet. They are connected with the air valve on the gun by one of the hollow uprights on which the trunnions rest. In the new guns, the pressure of the air in the reservoirs will be kept automatically at 1,000 lbs., by means of a valve to another reservoir, in which the pressure is kept at 2,000 lbs. or thereabouts, by a pumping engine. The whole of the parts which are continuously under pressure will be beneath the gun in bomb-proof cover.

The 8-inch gun throws a shell containing 100 lbs. of explosive to a distance of 3,000 yards, with an elevation of 33°, and a pressure of 1,000 lbs.

The projectile is made of drawn brass or mild steel, with a solid head, to get the centre of gravity well forward. As the pressure in the bore is so small, it was a desideratum to get the shell as light as possible, and so the walls are made very thin. This could be done with safety, for unlike an ordinary gun there is no rifling to necessitate strength and stiffness, and the friction in the bore being very small, there is little to strain the walls of the shell. It was necessary for accuracy, however, that the projectile should revolve about its longer axis, and to make it do so a tail of iron, with spiral wings or feathers at the end, is attached to it, giving it somewhat the appearance of an arrow. The first shells used had long tails like rockets; the centre of gravity being very far forward owing to the cast-iron head, they flew fairly well. The long tail was a great objection, and many different ideas have been tried to improve on it. The most satisfactory results have been obtained from metal tails about 2 feet long, with metal spiral vanes at the end, which are forced out by springs as soon as the projectile has left the gun. These tails unscrew, and are stored separately for convenience, and to allow a wooden gas-check to be fixed to the base of the shell. The projectile, which is plainly visible during its flight, is seen to be a little unsteady at first, then the pressure of the air on the inclined surfaces of the tail causes revolution, and it flies afterwards like an arrow.

At first sight it would seem to be much better to rifle the barrel, and dispense with the cumbersome tail, but further consideration shows that this would be unadvisable, if not impracticable. The

velocity is so low, and the projectile so long and light for its size, that very rapid revolution would be necessary. According to Greenhill's formulæ a twist of about one in eleven is what would be required. To give so sharp a turn to the shell would necessitate the walls being comparatively thick to stand the strain, and the gun tube would also have to be strengthened. The carrying capacity of the shell would be reduced and its weight increased, and therefore its range shortened. Besides this, an additional shock would be given to the explosive, which, with the heat caused by the friction of the projectile twisting in the bore, might cause a premature explosion.

When firing shells from an ordinary gun, it is always thought necessary to have penetration before the shell explodes. In this case the velocity being so low, and the explosive so powerful, it is thought that a greater effect would be obtained by the increased weight of dynamite, carried in a thin shell, than by the slightly increased penetration due to a stronger and heavier projectile. To make the shell strong enough to penetrate armour, would cause a very great loss in the amount of explosive carried. For instance, the shell of the 100-ton gun contains a bursting charge of, I believe, 106 lbs., and it weighs about eighteen times as much. The shell of the 15-inch pneumatic gun will weigh about 800 lbs., and will carry 600 lbs. of blasting gelatine or three-quarters of its weight of explosive. If 25 lbs. of dynamite could be fired out of the 100-ton gun, it is very doubtful if it would be carried unexploded through armour. Even with powder, explosions frequently take place before the shell has penetrated to its fullest extent, with the result to the target of less injury than that produced by a blind shell. Thus if we assume that a shell charged with a high explosive could be thrown from an ordinary powder gun, it would have less carrying capacity than one from the pneumatic gun. There would also be great danger from the abnormal pressures which sometimes occur in the bore, especially when it is heated by continuous firing, and these are just the conditions which are liable to explode dynamite, namely, heat and shock.

Very erroneous ideas usually prevail with regard to dynamite, which is often said to be exceedingly uncertain in its action, and the objection to the pneumatic gun is often made that the storage of the explosive will be a source of great danger.

Dynamite as it is now made has been described by Sir Frederick Abel as "one of the safest, most powerful, and most convenient explosive agents applicable to industrial purposes." It consists of nitro-glycerine absorbed in some porous substance, usually an earth known as *Kieselguhr*, in the proportions of 75 to 25 per cent. The nitro-glycerine is made by simply pouring ordinary glycerine into a mixture of one part of nitric to three parts of sulphuric acid. It has to be separated from and washed free of all acids, and this is one of the great dangers, for if any acid be left, it is liable to decompose and detonate spontaneously. The mixing with the porous earth has to be done by hand to ensure thoroughness. The liquid and the *Kieselguhr* are kneaded and worked through the fingers, until the mixture is thoroughly homogeneous, for any little knot or hard lump,

such as is sometimes seen in bread, would present a detonation point which a blow would explode. This is the second danger in the manufacture, but with dynamite as it is now made, concussion is quite harmless unless it is very violent and develops a temperature of 600° Fahrenheit. "The experiment has been tried of fastening it between the buffers of trucks and running them together; of throwing it from a great height on to the rocks of quarries; of dropping on it heavy weights; and even of lighting a train of gunpowder laid on the top—all without an explosion ensuing." It is probable, however, that blasting gelatine will in future be used, as it is more than half as strong again as dynamite. If the power of dynamite be represented by 1,000, that of blasting gelatine will be represented by 1,555. It is used more extensively abroad than in this country, most of the operations of the St. Gothard tunnel were carried out with it, and in Austria it has quite superseded dynamite. It also consists of nitroglycerine, but absorbed in a base which is in itself an explosive, collodion wool, instead of the inert porous earth of dynamite. It is in appearance like the sweetmeat called "Turkish delight." Blasting gelatine is safe to handle, and requires a very severe blow to detonate it. General Abbott, of the U.S. Army, told me that he had fired a bullet through it without causing an explosion. A magazine of this explosive would therefore be more difficult to explode than one containing powder, and would not require so much covering, or so much care in keeping it dry, for blasting gelatine as well as dynamite is unaffected by water. Unlike powder these explosives in their ordinary state cannot be fired by flame, and apart from a detonator they are practically absolutely safe. The cause of most of the accidents which have occurred with dynamite is that it freezes at the high temperature of 46° Fahrenheit, and when frozen it is extremely difficult to explode by detonation. Miners, who from long habit have got careless, thaw the frozen cartridges at a fire, instead of by the application of warm water, according to the directions, and explosions result owing to the fact that frozen dynamite will almost always explode by ignition, instead of burning away as in the normal condition.

Guncotton has also been used in the shells of this pneumatic gun, but without any advantage resulting, for it is no more powerful than dynamite. Wet guncotton has been substituted for powder charges in ordinary shells, and has been fired with safety, but being wet reduces its power, especially when no detonating charge of dry guncotton and fulminate of mercury is used. The explosion which takes place by simple impact is of a low order, only developing part of the power of the explosive, and as the initial point is in front, the resulting injury to the target is not so great as from a blank shell. By Zalinski's system of detonation, explosions of a high order are produced, evolving the maximum energy from the explosive, and the initial point is at the rear end, producing the maximum injury to the target. In case of very large charges, the system of electric currents and detonators allows of several initial points of explosion, from which greater effect is expected to result.

The shell from the pneumatic gun has two fields of action.

1st. Against the armoured hull above water.
2nd. Against the immersed part of the hull.
Lieutenant Zalinski, using Captain Lauer's formulæ, calculates that when blasting gelatine is used—

100 lbs.	will break	through	6·6	inches	of wrought iron.
200	,,	,,	9·3	,,	,,
400	,,	,,	13·2	,,	,,
700	,,	,,	17·4	,,	,,
1,000	,,	,,	20·4	,,	,,

Judging from his experiments he concludes that the result will not be confined to a small area, as with an ordinary projectile, but a very considerable space will be broken in about the point of impact, and a vibratory shock will be transmitted, which will find out any weak points in the vicinity. This has been borne out by experiments with comparatively small charges, so far as they have gone.

However, the primary object of the gun is to throw what is practically a torpedo, and its chief field of action is the hull under water, and it is chiefly with torpedoes that it must be compared. In submarine mining, a charge of 100 lbs. of gun-cotton, when fired in contact with the side of a vessel, or within 10 feet of it, has been found by experiment to be sufficient to disable her, and the charge of the Whitehead now, I believe, is about this amount. The 15-inch guns now being made will throw 600 lbs. of blasting gelatine, or equivalent to 900 lbs. of guncotton. It has been found from our own experiments that 500 lbs. of guncotton will disable an ironclad at 30 feet horizontal distance, up to 60 feet depth. This charge of blasting gelatine, therefore, should have a disabling effect at a distance of about 50 feet from a ship.

The Whitehead torpedo, though having a range of 800 yards, cannot be relied on for accuracy beyond 300, and it will only explode when an actual hit is made. The pneumatic gun will have a range of two miles, and as I will presently show by the results of experiments, is exceedingly accurate, also the shell will explode whether it hits a ship or only falls into the water. The Whitehead torpedo can be stopped by netting, its speed at most is 25 knots, it is expensive, bulky, and only a few can be carried. Nothing can, however, stop the shell of the pneumatic gun going through the air, its mean speed for two miles is about 340 miles an hour, it costs little, and takes up little room. These remarks about the Whitehead apply partially to other torpedoes such as the Brennan, the Lay-Patrick, &c., and although both of these are said to be more accurate, and have a longer range than the Whitehead, they cannot compare with the dynamite shell in these respects, or in the amount of the charge carried.

As regards accuracy of fire, the pneumatic gun is very satisfactory. When practice was going on before a United States Naval Board in June, 1886, five shells were fired at a range of 1,613 yards, and with an elevation of 10° 40′, a pressure of 1,000 lbs., and the cut-off valve set so as to produce 50 lbs. loss. Four of these shells attained the exact

range, and the other one went 7 yards over. The maximum lateral deviation was 6·2 yards, and the time taken in firing these five shots was 9 minutes and 40 seconds. The wind was light and variable, but no allowance was made for it. The result of these experiments was, that the United States Government ordered three pneumatic guns, and a cruizer to carry them, the details of which are given further on. The Italian Government also ordered one of these guns.

On the 17th August, 1887, four shots were fired at a range of 1,900 yards. The first, a blank shell, struck 1,976 yards away, and was 9½ seconds in flight, the extra range being due to an accidental oversight of 1,009 lbs. pressure, instead of 1,000 lbs. The second was fired at 2,600 yards range; it struck at 2,552 yards, being 11 seconds in flight, and exploded under water as intended. The third shot was a blank one, fired to test a new iron tail with spiral feathers, which unfortunately broke off in mid-air. The aim of course was spoilt, the projectile turned a series of somersaults, and found a watery grave long before its time. The fourth shell contained an electrical circuit, and was fired to test its working.

The range in all these experiments is obtained with great exactitude by triangulation. Observers are placed with plane tables on the bluffs each side of "the Narrows," the entrance to New York Harbour, and measure the angles to the place where the shells first strike the water. The bluffs run on each side parallel to the range.

The following experiments have appeared in most of the papers, so I will make the account as short as possible:—On the 20th September, 1887, Lieutenant Zalinski carried out another series of experiments with the 8-inch gun, this time against a condemned survey schooner, the "Silliman." The vessel was moored at 2,200 yards away from Fort Lafayette with her stern to the gun, and two blank shells were fired to get the range. The first fell 10 yards astern, and the second 8 yards short. The third shell contained 55 lbs. of blasting gelatine, and was fired with 600 lbs. pressure, and an elevation of 14°. After a flight of 13 seconds it struck the water close under the starboard quarter of the "Silliman," and exploding, threw up a body of water 150 feet into the air. The schooner was much shaken, water was pouring into her hold, and her mainmast had fallen over the side. The fourth shot fell in nearly the same place as the third, and exploded, seeming to lift the vessel out of the water. The hull was completely broken up, and the pieces floated off with the tide. The water tank which had been fastened to the vessel's bottom was blown up through the deck, and floated on the wreckage, and the stump of the mainmast was turned upside down. The bow was held above water by barrel buoys, and the foremast remained sticking up at an angle of 45°, its steel rigging being entangled in some of the wreckage. The last two shots had little left to destroy, the first struck the fore-rigging and exploded in the air, and the last fell into the water amongst the wreckage, and threw up a column of spray 200 feet high.

All these shells were distinctly visible to the naked eye, they gyrated a little at first, but soon steadied. The noise of the explosion was about equal to the report of a small field-gun, and curiously

enough there was a tiny cloud at each discharge, which instantly disappeared, and was probably caused by condensed moisture.

At first sight it is difficult to understand how such accuracy can be got with a smooth-bore gun. It is explained by the absolute uniformity of pressure on the bases of projectiles. The shell also cannot ballot, or bound about in the bore, as a spherical one does, owing to its great length, and the friction with similar projectiles is the same at every discharge; with well-made projectiles, therefore, there is no reason, theoretically, why it should not be always possible to reproduce results time after time, and this has been found to be the case in practice.

The high-angle fire of the pneumatic gun is often compared unfavourably with the flat trajectories of our modern powder guns. The comparison is hardly a fair one, for the pneumatic gun should be considered more as a torpedo projecting machine than a gun. Still its high-angle fire, being accurate, possesses several advantages of its own, and errors in estimating distance are to some extent compensated for by the double field of action of the shell.

When fired at ships, the projectile has the deck as well as the sides as a target, and probably it would do even more damage if it missed, and fell into the water close by. The object aimed at with this gun therefore is not the side of a ship, as with an ordinary powder-gun, but the space enclosed by a line drawn round a ship and 50 feet away from it. The moral effect of shells falling from the sky, fired by an unseen foe, and with no report or smoke to warn of their coming, must be very great, especially when it is known that if one strikes anywhere near the ship, she is in all probability doomed. These guns and shells are comparatively very cheap, and sufficient numbers of them could easily be supplied for the defence of a harbour, so as to ensure that a ship forcing an entrance should be struck as least once. Coast defence would appear to be the most useful field for this gun, and it would be a valuable adjunct to a system of submarine mines. It is often impracticable to place mines in every avenue of approach, from the enormous quantity of stores and men required. Pneumatic guns could be placed where they could cover channels by their fire, and when at last the enemy has cleared a channel through a mine field, torpedo shells could make his advance through it impossible. The range of the gun is such, that it could throw shells beyond the practical limit of the system of submarine defences, and could annoy an enemy when checked by the mines, and preparing for his attack on them.

When mounted on shore, these guns might be in sunken emplacements, and being fired at such high angles, they need only be visible when firing, and all the air compressors, storage reservoirs, and engines for a group of guns, could be easily protected in underground bomb-proofs.

The gun could be mounted in torpedo-boats, and used in place of the present Whiteheads. The boat could then remain much farther away from the ship attacked, and would not run such terrible dangers as the present torpedo-boats are exposed to from quick-firing guns,

when advancing to get within range. The danger to the torpedo-boat may be taken to be inversely as the square of the distance. Thus, a boat advancing to 350 yards to discharge a Whitehead, would only have one twenty-fifth of the chance of escape of a boat firing an aërial torpedo from a pneumatic gun, from a distance of one mile.

The cruizer which is now being built for the United States Government by Messrs. Cramp and Sons, of New York, is to carry three of these guns, two of $10\frac{1}{2}$ inches and one of $12\frac{1}{2}$ inches. The $10\frac{1}{2}$-inch shell will contain 200 lbs. of explosive gelatine equal to 320 lbs. of dry guncotton, and the $12\frac{1}{2}$-inch 400 lbs. or equal to 652 lbs. of the same explosive. The guns will fire fore and aft, and will be directed by steering the vessel, the contract speed for which is 20 knots an hour. The length of the vessel is 230 feet, beam 26 feet, and draught 7 feet 6 inches, she will have twin screws, and steam steering gear. She is designed so that the helmsman can control both the engines and the rudder, and fire the guns. The contract price for the ship is $350,000 or about 74,000*l*.

The new guns will be mounted on much improved carriages, and will have novel arrangements for loading. One man will be able by the movement of a single lever to open the breech, cause a projectile to be placed in the bore, close the breech, and put another projectile in position for loading. The contract is for at least one discharge per minute. The guns are to be of bronze, 40 feet long, but this length is not absolutely necessary; Zalinski now says he can reduce them to 24 feet without loss of range. Though 40 feet seems to be a great length, it is surpassed by some of our modern guns, the 100-ton gun for instance is 46 feet long, and it can hardly be claimed even for it that one successful shot will destroy an ironclad.

When mounted on board ship, this gun would be very useful to clear a channel through systems of submarine mines, by using the shells as countermines. If the ship were anchored within range, shells might be dropped in the channel at constantly increasing ranges, and thus destroy or explode all the defender's mines along a certain line. On board ship there would be no difficulty in working an air-compressing engine from the boiler, but on shore, if there were no facilities for getting up steam, air could be compressed by small explosions of gas or even powder.

When we remember that the results which have been obtained were with the 8-inch gun, and that this year a gun will be in existence which will throw six times the quantity of explosive, or eleven times the amount carried in the shells which destroyed the "Silliman," it is impossible to resist the conclusion that we have here a most formidable weapon, which will have a serious influence on the result of the next naval war. It is therefore to be hoped that our Government will find means to procure some of these guns, and that we shall soon hear of experiments being carried out with them in England.

Lieutenant-Colonel BUCKNILL, R.E. (retired): I should like to make a few remarks upon this subject that Captain Haig has brought before us, having inquired somewhat carefully into the matter last year, and gathered as much information about it as I could. Lieutenant Zalinski wrote me a very interesting letter in November last,

soon after the publication of the "Silliman" experiments in "Engineering." I had asked him whether the time-fuze could be relied on to explode his torpedo at any desired depth, or whether in the "Silliman" experiments he had used a retarding fuze so that the charge exploded after reaching the bottom. This is a very important point, inasmuch as the efficiency of the arm as a submarine mine or torpedo depends to a great extent upon the accuracy of the time-fuze, especially when the vessel attacked floats in deep water. His reply was, "I assure you that I have the time of explosion of the shell, with reference to the instant of striking the water, fully under control. It requires simply practice to be able to transform the element of known *time* to close approximation of known *depth* where the explosion is to take place. I can, furthermore, assure the shell getting absolutely to the bottom, whatever may be the depth, before exploding." He means no doubt that he can either explode the shell by time, or retard it as much as he likes. Also, "It seems to me that the value of the gun has been clearly demonstrated: Firstly, as an adjunct of stationary and movable torpedo defences operated from the shore: secondly, for countermining, and as an antidote" (the four last words I do not quite understand); "thirdly, for use as a torpedo from shipboard at ranges, say, at least double the effective range of Whitehead and similar torpedoes. In this last claim I have kept very far within the range at which I really think it can be made effective, in view of many doubts expressed by naval experts as to the accuracy of fire from moving platforms. I believe that there are elements to counterbalance those uncertainties, possessed by this weapon and not possessed by either the powder guns or Whitehead torpedoes. I do not claim superhuman certainty of results. Practice, skill, and nerve, or the human element, must come in," &c. With this came a pamphlet of thirty-four pages in which Lieutenant Zalinski carefully gives the history of the invention, and brings it up to recent date. It was a paper delivered at the Military Service Institution of New York, and no doubt can be obtained by those who want it. It was accompanied by photographs, some of which have been published in "Engineering." Mr. Mefford deserves very considerable credit for having brought forward this idea in the first instance, especially when we consider the success of the first gun. No one could have anticipated that the first gun in its crude form would have thrown charges across the Narrows. The accuracy of small rifled air-guns has long been known. Many people have used them for rook shooting. General Palliser used to say that things true in a small scale were often true on a large scale. By that argument it would appear that if the difficulties with reference to ammunition could be got over, a short rifled gun would be preferable and more accurate than a long unrifled gun. One of the great defects of this system, the length and size of the tube, would thus be obviated. It is no joke to have a tube 40 or 60 feet long in a vessel, especially in a torpedo-boat, as any sailor will admit. It takes up all the room. I remember going on board the "Fortune" and "Triana" in Washington some years ago. They each had a long internal tube inclined in the other direction downwards. The tube filled up all the fore part of the vessel (vide p. 539, vol. xvii, Journal R.U.S.I.). These Mefford tubes in a torpedo-boat would require a long hull to carry them. Moreover, even on shore, tubes 60 feet long, arranged as per diagram on wall, require pits 120 feet in diameter; which would be shell traps. Captain Haig implies that their position would not be known, but we must give an enemy credit for knowing beforehand where pits containing huge pieces of ordnance like that are located, and also for taking the proper measures for silencing their fire in the same way that rifled mortars and howitzers would be silenced, viz., by high-angle fire. Captain Haig considers that these guns would be of use after the channels had been cleared of the submarine mining defences; but that is not probable. I think the gun would be put *hors de combat* before the channel had been cleared. According to the naval view it does not take long to clear a channel, if we may judge from the Milford Haven experiments; but I think the channel would probably not be cleared before the gun was smashed up. The gun, therefore, cannot protect the channel after it has been cleared. Lieutenant Zalinski has told Captain Haig that the tubes may probably be made 24 feet long to do the same work, and obtain the same range. That is very important, because a tube 24 feet long is of course not nearly so much in the way as a tube 60 feet long; and if he can get all the results from a

24-foot tube that are now produced from a 60-foot tube, it puts the thing in a more favourable light. But it is hardly to be expected that a tube 24 feet long worked at the same air pressure would produce the same range. It must have a higher pressure; and then comes the question, what results might be obtained with that higher pressure in a tube 60 feet long? You might get an extremely high range with a tube 60 feet long and the increased pressure he probably intends to use with the 24-foot tube. Going from the gun to the ammunition, perhaps the latter is the most important part of the invention. This is the only portion that Lieutenant Zalinski has patented in this country, viz., an electrical fuze in connection with ordnance generally. In carrying out the experiments with this gun he discovered that when the point of ignition is in the rear of the shell a greater penetration of armour is produced. If this be so for the small velocities of the air-gun it may be so with the greater velocities of the powder-gun. If so, this may be an important point for all ordnance, and a thing to be worked out. The fuze actuated by electricity as proposed by Lieutenant Zalinski has done its work most successfully. A fuze could not probably be actuated in the same way by a plunger from the front of the shell striking a detonator at the back; but it appears to be quite easily under control in the method which Lieutenant Zalinski has patented. [This electric fuze for shells was then described with the assistance of a chalk diagram on a blackboard. It is also described and illustrated on page 148 "Engineering," 12th February, 1886.] I wanted to ask Captain Haig whether the cold produced by continuous firing would have any effect upon the ammunition. This is important inasmuch as the voltaic cell in the fuze contains liquid, and dynamite freezes at 46° when it becomes inert. With reference to the charge, it seems to me most important that the explosive contained should be the most insensitive possible, and yet the most powerful. For these conditions dynamite does not appear to be a good explosive to employ, because experiments have shown that if you explode 5 lbs. of dynamite under water 25 feet from another charge of dynamite, the second charge will be exploded by what is termed sympathetic detonation; whereas if you employ blasting gelatine it will not be detonated by the same charge at distances exceeding 5 feet. If you take wet guncotton it is, I believe, still less sensitive, but experiments have not proved the latter. Wet guncotton and blasting gelatine appear to be preferable to dynamite for use in this gun, because they are less likely to be detonated accidentally. Captain Haig said there might be some fear when using rifling on account of the rotation of the shell producing friction between the charge and the shell-wall. That might be obviated in this way: if you had the shell made in cross-section, like a wheel with the nave cut out, or a simple longitudinal diaphragm crosswise (chalk figures on board) the charge could not be rotated at an unequal velocity with the shell, and any friction inside the shell, due to spin, would be prevented. I think that if we had a sufficiently slow powder its employment would be as good as air. In conclusion, I wish to say that there appears to be every reason to suppose that this gun will be a great rival to the locomotive torpedoes of the present day, such as the Lay-Patrick and the Brennan. Evidently an arrangement which throws torpedoes 2 miles through the air at the rate of one per minute must be more effective than the Brennan torpedo which has to be actuated by wires from a distance at a much slower rate.

Captain F. G. Stone, R.A.: I quite agree with Colonel Bucknill in many of the remarks that he has made; in fact he has, to a certain extent, anticipated what I was about to say. I think that the gun which Captain Haig has so kindly described to us, and in which we have all taken great interest for some two or three years past, has undoubtedly too low a pressure and too high an angle of elevation to give satisfactory results. I think Captain Haig says that with an elevation of a little over 10° the projectile will range for something about 1,600 yards—something under 2,000 at all events. Of course before any modern ironclad came within range of that weapon, I imagine that the said weapon would be destroyed, because if it cannot fire at much greater ranges than 2,000 yards with sufficient accuracy and sufficient weight of shell to resist the wind, it would probably be destroyed by the powder-guns of the ironclad before it was able to fire a single effective shot; and I do not suppose the ship which it was going to attack would necessarily pick out a calm for the purpose, as is done in the case of experiments; therefore I think the ship

would probably have the best of it. The difficulty Lieutenant Zalinski has had to contend with in making a shorter gun with a higher velocity is that after pumping air into a cylinder of any sort which contains air, until the limit of pressure which it is possible for the cylinder to resist has been reached, he has still to get ballistic effects; that is to say, to evolve the air from the orifice in the cylinders at a high rate of speed. We find after a pressure of about 200 lbs. to the square inch has been reached, the density of the air has been so much increased by that pressure that it is practically impossible to get a higher ballistic effect than is obtained by about 200 lbs. on the square inch, and although you may have a pressure of 1,000 lbs. on the square inch, the velocity will not be increased beyond what is obtained by a pressure of 200 lbs. Of course it will fire a greater number of projectiles; but that is not the point. We have in England, I think, what is probably hardly known yet, but at all events I believe we have a gun invented by Mr. Maxim in which he has got out of the difficulty with regard to the higher pressure by a very ingenious invention, which I am not at liberty to explain fully, but the principle is this, that he has a very small portion of gas, such as coal-gas or gasoline, mixed with the air in the reservoir which of course makes an explosive compound. As soon as the shell has travelled on the same principle as the Zalinski gun, about 2 or 3 feet up the barrel of the gun, this pressure acts on a small piston or fuze in the gun and explodes a detonator. The result is that the mixture of gas and air in the gun at that time is also exploded, and whereas the shell starts with a velocity acquired by pressure of about 200 lbs. on the square inch, the pressure in the gun is enormously increased, not by compressing more air into the barrel behind the shell, but by raising the temperatnre of that air to such an extent that you can obtain a pressure of about 1,000 lbs. on the square inch without any increase in the weight of the air. This gun is not made, but the designs are before the Government at the present moment, and Mr. Maxim believes he will be able to make a gun on that principle at least half the length of any gun made on the principle which has just been described to us by Captain Haig. and with at least twice the effect. Another advantage of course will be that we shall be able to use a rifle barrel; and with regard to Captain Haig's objection to rifle barrels I do not think we need be afraid, because dynamite and nitro-glycerine and that sort of thing does not explode except by the action of a detonator. As Captain Haig has also informed us, and to prove this, we have the experiment which the French have lately been carrying out at Bourges with their siege-guns and with melinite shells. The first gun they fired burst owing to the premature explosion of the shell. They were not discouraged, however, and carried out further experiments at Malmaison with most successful results, and 200,000 melinite shells were ordered for siege service with the French artillery: so that there need be no fear on the score of premature explosions in rifled barrels on the score of heating, considering that the French guns were not only rifled but fired with a charge of gunpowder, which, of course, is much more violent in its action than air pressure, as well as setting up a considerably greater degree of heat in the barrel than could be caused merely by friction.

Captain LLOYD, Grenadier Guards: There are one or two remarks that I should like to offer, as I had the opportunity of seeing Lieutenant Zalinski and the gun some six weeks ago. When I went to see it Lieutenant Zalinski most courteously showed and explained everything to me. As to the length of the gun, I was assured that it was pretty certain not only to be reduced by 4 feet, but so much so, that in the future it would possibly be cut down to near the length of an ordinary rifled gun. Next as to the motive power. I asked Lieutenant Zalinski if he was satisfied that pneumatic was the force that would be finally used. His answer was that pneumatic was the best, in fact, the only force that could be applied up to the present time, but that he was by no means sure that it was the force of the future, and that he was continually carrying on experiments with a view to finding out if there were any better. Thirdly as to the flight of the projectile. When I saw the gun fired, the shot did not appear to me to travel as steadily as the lecturer states. On first leaving the gun it flew very true, but after a time it began to wobble, the motion increasing till it reached the culminating point. After turning, the gyrating continued for some 20 or 30 yards of descent, when it suddenly seemed to steady and fell truly into the water, when it exploded as has been described. It seemed

to me that although the accuracy of aim was very great there would be little probability, or rather great difficulty, in hitting an object moving with any rapidity, as the projectile was so very slow in travelling from the gun to the target. However, there is one thing that should be remembered, and that is, that this gun is in its infancy, and that the American company to whom it belongs, assisted by Lieutenant Zalinski, are spending a great deal of energy, time, and money in finding out every possible means of improving it.

Colonel C. B. BRACKENBURY, R.A., Director of the Artillery College: We must all be very grateful to the lecturer for the information that he has given us, and we artillerymen especially welcome our brother engineers when they take up the subject of artillery, as they occasionally do with very good effect. I am glad to hear that the curious weapon which we see here is called a gun, because now-a-days we are rather too much accustomed to hear in England that guns are of no use. Looking at the size and general dimensions of that weapon as displayed on the wall, I really do think it at least cannot be claimed as an infantry arm. One word with regard to the tail of the projectile. It strikes me that when you have, as in this case, a projectile which in passing through the air obtains its rotation by the resistance of the air, you must have the velocity very much delayed, and as that velocity is already at starting not great, and as you may have to deal with a cross wind, I should like to know from the lecturer what experiments have been tried with regard to the steadiness of the flight of the projectile when influenced by wind. That is a very important point, I think. Of course this piece is rather what I should call a mortar, or howitzer, than a gun. A very considerable time ago, very shortly after the Franco-German war, I know the subject of placing anything which could give curved fire completely out of sight, even within a town, perhaps in a market place, or somewhere of that sort, attracted the attention of the authorities at Berlin, and a good deal was said and thought about it at the time. I do not know that it would be absolutely necessary to place such a piece of ordnance in a pit; it might even be behind houses, or anywhere out of sight. Science is arriving at a point when it is not necessary to see an object in order to fire at it, and I am sure Major Watkin, if he were here, would be able to tell us that he would design an apparatus for the purpose very easily, and that a piece of ordnance, of whatever description, can be fired and hit a target without any necessity that the men who work it should see the target at all. One advantage, undoubtedly, of this weapon, especially in cases where you wished to hide it, would be that there would be no smoke. The little puff spoken of by the lecturer would not mean smoke which would be seen to any considerable extent by the enemy. But there is one point which the lecturer spoke of, and against which I am very anxious to protest, and that is, the claim that blasting gelatine, or dynamite, or any composition of that kind, can be said to be at all safe. Perhaps it may be replied that guncotton is safe. I have had to deal with the manufacture of guncotton, and in the process we have a quantity of finely-divided pulp floating about in a large quantity of water. Some of this fluid material is placed in a mould and pressed, so that part of the water is expelled; it is pressed again in another mould, and another large quantity of water expelled, still leaving it with 25 per cent. of water, and in this second process the water is bubbling up out of it like a fountain. On one occasion, while the water was, as I say, bubbling up like a fountain, that guncotton exploded and blew the machine to pieces. These are accidents which happen with what we may call chemical explosives, and such explosives are all very dangerous. There was a case which happened after that. The Committee which had considered the well-known explosion of shells at Gosport had under consideration a proposal that guncotton should be placed in a magazine in a certain place, because it was so little dangerous compared with gunpowder. I strongly protested against this idea. An experiment was made by which two tons of guncotton were placed in a hut and burnt, and some of our most distinguished chemical men who had most to do with guncotton were of opinion that it would burn away. The result was, there was a most extraordinary explosion, more like a detonation than anything I have heard in my life, and our distinguished ordnance chemist, Sir Frederick Abel, was very nearly killed. Therefore, I am anxious that there should not be a word said about these compositions only burning, or about placing them in dangerous situations, or

imagining that there is no danger in their employment. One and all, they are quite as dangerous as gunpowder, and should be treated with at least the same precautions. But still I am of opinion that all weapons of this sort should be tried by us. I do not wish to run this gun down in any way. It might in certain cases be extremely useful, and it is cheap. I do not think we have nearly experiments enough. We are too theoretical, and too little practical in many matters; and anything which may economize the number of men required for firing and may save life, considering the very few soldiers we have to deal with, is by us to be welcomed. Mr. Ruskin says that England ought always to be standing on her shores and waving bank notes in the air to all the people who possess five pictures by the old masters. I think we ought to do something of the same sort with regard to weapons; we ought to wave our bank notes in the air and say, "If anybody in the world invents anything that is good and economical, let him bring it over to England, and he shall here have a fair trial and a fair field."

General BRAY: We have had a most important lecture, one that will turn the attention of the country, and especially the military and naval forces, to the great questions which are now being tried in various parts of the world connected with the firing of high explosives. This of itself is very important. I think the second paragraph of the printed lecture is slightly incorrect. Captain Haig there says that "the problem of using dynamite, guncotton, or other high explosives in shells, has for some time past occupied the attention of artillerists, but so far the attempts to throw such shells from guns, by means of the ordinary powder charges, have not been successful. Small charges of dynamite and guncotton, it is true, have been fired in projectiles, but usually such experiments have resulted in the premature explosion of the shell in the bore, and the consequent destruction of the gun." That is slightly incorrect, for this reason. Captain Haig should know, as a good many people do know, that there have been experiments conducted at Constantinople by the Turkish Artillery during the past month of December by the American Mr. Snyder, who has absolutely fired at targets made to represent the side of a man of war, covered with wrought iron plates 12 inches thick. Eleven shells loaded with nitro-gelatine were successfully fired out of an ordinary American field rifled breech-loading howitzer of 15 centimetres. The range at which they were fired was certainly not large, only 200 yards, but when the target, a foot thick of welded iron with oak backing to represent the sides of a man-of-war, was struck, it was so utterly wrecked that they could not fire any more shots at it. The remaining ten shots were fired at other objects in the distance at the hill side, but without any very particular result, for there was no target to fire at. But Mr. Snyder proved this, that these shells loaded with nitro-gelatine were fired with perfect safety, that is to say, eleven shots were fired, and without accident of any kind. The gun was manned by Turkish Artillery, and several Officers, including General Asif Pasha, the Turkish Director-General of Fortifications, were on the ground superintending the experiments. After these trials, illustrations of which you may see in the "Illustrated London News" of the 7th of January, Mr. Snyder gave a lecture at Constantinople at the College Robert, explaining to the audience what these experiments were, and what he proposed to do. He stated that he used a gunpowder charge, and that the secret of his being able to fire the shells with safety was by putting a cushion between the charge and the shot, and also by the peculiar preparation of nitro-gelatine used. To deaden the shock of the explosion of the charge, he stated that another system, that of compressed air, has also been tried, but for this method you would require a complete machinery: first a machine to compress the air; secondly, a steam-engine to work it; and thirdly, to fire a 6-inch shell a cannon of about 65 feet long would be required. Admitting that that can be done by means of compressed air a pressure of 3,000 lbs. on the square inch would be required, but no reservoir would be able to bear the pressure which would necessarily have to be sustained. The advocates of the pneumatic system assert that an ordinary cannon resists an explosion which develops a force of 20,000 lbs. on the square inch, but they forget that the action of gunpowder is instantaneous, while compressed air has all the time to act, and would penetrate fatally the hardest metal. In one word, by means of gunpowder, a pressure of 39,000 lbs. on the square inch may be arrived at, whilst with compressed air the pressure may not be

above 1,500 lbs., therefore the pneumatic system is to be rejected as impracticable. The trajectory would be too high. That is what he (Mr. Snyder) objects to. I think Colonel Brackenbury has struck the nail on the head, when he says that these things ought to be experimented upon in this country, and I hope they will, because we have fallen on curious times. It is perfectly plain that wonderful experiments have been made more or less successfully, in America especially, and in other parts of the world, and it is essential that a great Naval Power like England should be well posted up in the whole subject and ready, if necessary, to take advantage of that which is most practical and can be used. That would be a most important part of this lecture, and whatever we may think of that gun which has already been criticized by other competent Officers, I will say nothing more about it than this, that I trust it will be tried, that experimenters will be invited to this country to see what they can do, and if they can work out any good proposal practically, the result must be very momentous; because it is clearly proved that if any one of these guns proves successful, be they Snyder's or Zalinski's, or any other, it involves absolutely a revolution in naval warfare, with all the extraordinary changes in ships of war which might become an immediate result of using high explosive shells in naval war.

Admiral R. Scott: As a naval man, I should like to say a few words on this paper. We certainly do not want more machinery on board ship, but should, where possible, simplify our war material, whilst keeping up its efficiency. The torpedo was at first discharged by means of air-compressing machines, but that was found unsatisfactory, and powder was substituted; and I believe powder is still used, as being the simpler and better method. I think it is a mistake to say that there is greater friction from a rifled projectile's passing along the bore, centred in the gun, than there is from a smooth projectile's rubbing along the bottom of a smooth-bore gun. In regard to our powder we have still difficulties; the abnormal pressures spoken of by the lecturer are certainly developed by high charges, the simple reason being that our powder cartridges are not made up upon a proper system, and certainly not upon a correct mechanical one. There is on that table the model of a powder charge. The principle of its arrangement is such that the powder is ignited in its centre, and then goes on burning outwards at an evenly progressive rate, and keeping up a steadily increasing pressure upon the base of the projectile. The result is that a far higher velocity is obtained than has been yet got with any other description of cartridge. This special powder is made by Messrs. Curtis and Harvey; it is waterproof, and will withstand the changes of any climate. The model on the table is that of a 6-inch gun charge (with the central portion removed), and the principle of the arrangement,[1] which has been so ably worked out by Messrs. Curtis and Harvey, is due to a naval Officer. I think what has been said by those who have previously spoken, with reference to the unreliability of high-angle fire, is perfectly correct. We have long been aiming at getting as flat a trajectory as possible, as a means for securing accuracy; but how are we to correctly estimate the distance and fire accurately with ships moving rapidly? For instance, supposing our squadron to be closely engaging that of an enemy, and at some 1,600 yards off our torpedo-boats are moving about and firing dynamite missiles at the enemy's ships: suppose also that in the heat of the action the tails of some of the missiles were to break, and the shell come down and explode upon our own vessels, what would be the result? Instead, therefore, of being dependent for rotation and accuracy upon the proper action of the expanding tails of such missiles, how much better would it be to have the certainty of rotation which is given by the gun? You could then fire safely past a friendly ship at the bow or stern of an enemy; whereas, with these projectiles you could not venture to do so. Then as to the high explosives mentioned, and which have been said to be safe. We know very well that there have been very serious explosions with them; and one vessel which sailed with a cargo of guncotton was commonly reported to have been blown up by it. I think, therefore, that we should hold to our own safe appliances, and simplify the means of using them so far as possible. We are rather too fond of going into com-

[1] It is applicable to all charges for guns filled with high explosives.—R. A. E. S.

plications when we could use simple and safe machines, or get an equal result from manual power; let us then remember that no machine is so reliable as the intelligent power of a human being.

Admiral P. H. Colomb: I did not intend to make any remarks, but the Chairman thought it might be advisable that a couple of naval men should say what they could about the paper. The subject is one which I cannot say that I have studied at all, but I suppose most of us have felt for many years past that sooner or later we should have to deal with arrangements for using the high explosives in shells. I myself have had a pretty fixed idea on the subject which this gun does not embody. I was rather glad to hear Colonel Brackenbury uphold new inventions of this character, and say that they were good things. I suppose as one gets old, one has not the same vigour that one had when younger, and does not view so complacently the continual change of weapons which is going on. We have spent largely on the torpedo, but we have not learnt yet what the torpedo means. We do not at this moment know exactly how we are going to use it, and yet it is threatened with supersession, according to the lecturer, by a new weapon of which we know still less. Of course it may come out perfectly right, but the general result, as far as I can see, of the superposing of a new invention before you have quite settled what the old one means, is that it leads you to a great deal of exceedingly useless expenditure of money. The Brennan torpedo cost first of all in a round sum the other day, as a reward to the inventor, 100,000*l*., and there appears to be a general feeling in the meeting, all the speakers seem to have spoken of it more or less, that it is already discounted and gone, whatever else remains. As a naval man, I believe I speak the naval view in saying that we do not much fear high-angle fire. Undoubtedly when you have a shell of very large radius of action, such as that described to-day, the accuracy of the high-angle fire is by so much increased; but, notwithstanding this, I believe at this moment that the naval view would be that the torpedo-boat, with all its inconvenience, was a nastier thing to face in a big ship than half a dozen of these dynamite guns. I believe we should say that her action was likely to be more certain, following up rather what my friend Admiral Scott has said, in that they are conducted to their proper place by an intelligent man, and not by a screw at the rear, which is liable to come to grief in some way. I do not think there is anything more that I have to say. I am afraid it is inevitable that we should invent these things, but I think there is one point which ought to be very clear to us as Englishmen, that it is not every weapon which is the right kind of weapon for England to use. The present weapon, as far as I can see, is a weapon essentially for the country whose territory is likely to be attacked from the sea. I do not believe that for many generations to come any part of English territory is likely to be attacked from the sea, and therefore I do not lay stress upon our possessing ourselves of a weapon which, so far as has been stated to-day, will be most useful in repelling an attack from the sea, that is to say, that I do not think we need spend very much money upon it. If you come to weapons which are useful in attacking territory from the sea, then I think we may carry out large experiments and expend freely and largely in order to possess ourselves of the best form of that weapon.

The Chairman (Admiral Boys): Perhaps I may make the few observations I have to make at this time, instead of after the lecturer has replied. It is a known fact that high-angle fire depends upon accurate knowledge of range, and upon having a steady platform. That I think rather precludes this weapon from some of the purposes for which it is advocated. It is almost an impossibility, especially when a ship is moving through the water, to know what the range of an object is accurately, and, besides that, the steadiness of platform of any floating body, I do not care what its size may be, is never perfect. As an instance of this I need only state what happened in the trials between the "Hotspur" and the "Glatton," when the "Hotspur" fired at the "Glatton's" turret in Portland Harbour. There were two vessels of 4,000 tons each, the water being perfectly smooth, it was a dead calm. The vessels were secured to the breakwater at the exact distance of 200 yards from each other, and yet even under these conditions, looking along the sights of the gun, there was a motion sufficient to carry the axis of the gun from the bottom of the turret to the top, and in the case of firing one of these pneumatic

guns, that would materially affect the range. I must differ from the speaker who put this weapon in the category of the Whitehead. I place it in the category of mortar or high-angle shell firing. In the first instance the Whitehead travels and strikes the object at a certain depth below water. It seems to me a perfect impossibility that with the electric fuze the depth of the explosion under water can be accurately regulated when firing at distances of 2,000 yards and upwards. Then as to the description of the American cruizer which is being built to mount this gun, there may be some American gentlemen here, and I dare say they will excuse me if I say I think they have made a grand mistake in building a vessel 230 feet in length to be pointed at an object (of which the range must be accurately known), by steering the ship. In my opinion that is impracticable, and I can speak with some experience, because it happened to fall to my duty to make the trials of our original gunboats of the "Staunch" and "Comet" class, on which the guns were mounted, fixed to the deck, and pointed by the helm, and I came to the conclusion that between 90 and 100 feet was the extreme limit to the length of the vessel in which any degree of accuracy could be arrived at by making the ship the gun carriage, and by steering her. I do not think it is practicable to mount this tube in a torpedo-boat; there is not room for it and its ammunition, and if we did, the torpedo-boat would never be at the known distance to project these shells with any chance of success. I should like to ask the time that does elapse between moving the handle for firing the projectile and its leaving the mouth of the tube, because the direction in which it leaves the muzzle of course is the direction of its flight, and, as it has a very slow initial velocity, there must be a considerable interval of time, and that interval of time may materially alter the elevation of the weapon when mounted afloat. Another point that has been spoken to is the ignition of the shell at a certain point. Now, if this projectile is to strike a ship's deck, it would be advisable that the ignition should be in the rear, but if it strikes the water, it appears to me that is reversed, because if the angle of elevation is 30°, the angle of descent is greater, and the fuze should be at the other end, the charge should exert its force as it were backwards, not forwards. These appear to be objections to this weapon, and as a naval Officer I think it is right that they should be pointed out. I think our duty here is to criticize, and I am sure our lecturer is glad to hear fair criticism. I think it is very desirable that some experiments should be made with it, in fact if anything is to be done about it, it is a necessity. After all it comes to a matter of £ s. d. The question is, Are the experiments we would propose for this gun worth the money demanded for the purpose? If we could obtain one or two guns on reasonable terms, not hampered by costly conditions, by all means let us do so. I think there is a future for this weapon, but my own opinion is that it is a military weapon, and not a naval one.

Captain HAIG, in reply, said: Colonel Bucknill made a great point about the length of this gun. The length, as I said in my lecture, is only 40 feet, and Lieutenant Zalinski now says he can make it 24 feet without loss of velocity. Now, the 100-ton gun is 46 feet in length, so that if you compare the Zalinski gun with the 100-ton gun there is nothing to complain of in length. Colonel Bucknill asks if the cold caused by the expansion of the compressed air would have any effect on the charge. I cannot say if it would, but certainly the cold of the atmosphere will have an effect, and as dynamite and gelatine freeze at 46° Fahr., and are exceedingly difficult to explode when frozen, they are neither suitable to a cold climate, and we should have to use some other explosive. There are plenty of new explosives being invented now, and no doubt some of them would prove more suitable. If they do not, guncotton would have to be used. Colonel Bucknill referred to the friction between the steel and the charge as what he thought I referred to as a danger. I meant the friction between the shell and the bore, which struck me as possibly raising the temperature, combined with the shock sufficiently to ignite the dynamite. Captain Stone referred to my objection to rifling. He thought my objection was on account of the friction between the shell and the bore. I only added that as a remark after my principal objection, which is the diminution of space for the charge. If you rifle your bore, not only must you increase the strength of your gun, but also of your shell. The sides of the shell must be made thicker, and consequently the space inside would be smaller for the explosive.

Colonel Brackenbury asked if any experiments had been carried out with regard to firing the projectile in high winds, which of course is a very important point; I am not aware of any experiments being carried out. It is a question which I have not yet received an answer to from Lieutenant Zalinski, and, the question of high-angle fire coming in, combined with the slowness of initial velocity—only 800 feet a second—of course the projectile would be a good deal affected by wind. A set-off against that is that the projectile has a very much increased area of destructive effect. Fifty feet outside, the whole way round a big ironclad, would make a very large target to aim at. Colonel Brackenbury says the chemical explosives are dangerous, and gives an instance of burning guncotton exploding when it was burnt. It seems to me hardly a fair test to say an explosive is dangerous because you cannot burn it safely. You would not start with burning gunpowder. It is hardly fair to say because you cannot burn guncotton with safety that it is not safe to put it in a magazine. I have had a great deal to do with guncotton for the last eight years, and I have never known or heard of an accident with it in the submarine mining service. It is extremely safe as far as my experience goes. Colonel Brackenbury mentioned an explosion while compressing guncotton. It is hardly fair to cite explosions occurring in manufacture as showing that an explosive is not safe. How many explosions have happened with gunpowder in manufacture. We constantly hear of them: yet gunpowder is considered safe to work with. General Bray referred to some experiments in Turkey with regard to firing high explosives out of powder-guns. I have seen the results of these experiments, but it appeared to me that they have not yet gone quite far enough. General Bray said they fired eleven times with safety and effect. I saw at Sandy Hook, New York Harbour, a powder-gun out of which they had fired fifteen dynamite shells with perfect safety; the sixteenth reduced the gun to a mass of fragments. I have no doubt after the eleventh they thought it perfectly safe to fire a dynamite shell out of an ordinary gun. The chairman referred to high-angle fire depending upon steady platforms and knowledge of range. In attacking submarine mine defences no ship would commence in stormy weather. In countermining operations the weather must be calm; so that by anchoring you would probably have a somewhat steady platform. On this gun Lieutenant Zalinski has a telescopic sight and range-finder, by which he can get the range with extreme accuracy. With regard to the explosion at certain depths, the chairman did not believe it could be regulated at these long ranges up to 2,000 yards. As a matter of fact the range has but little to do with the depth at which an explosion will take place. The explosion is regulated by the electrical circuit inside the shell getting wet—I am talking of when the shell falls into the water. There are small holes in the fore part of the shell with little shields over them, and the water enters through them to the dry chloride of silver cells. In these cells is some powdered chloride of silver and sal-ammoniac, kept in there by cotton wool, and when the water enters it moistens the powdered acid and starts an electrical current which fires the shell. That action will happen as soon as the shell has gone a sufficient depth, that is to say, as soon as the water has had time to penetrate. A shell will always take about the same time to sink 30 feet at one range as at another range.

The CHAIRMAN: The trajectory would affect it.

Captain HAIG: It would to some extent, but it is always fired at a high angle. With regard to getting one gun, I believe an offer of one gun was made some time ago, but after the last experiment of blowing up the "Silliman" the offer has been withdrawn, and the company will not part with a single gun; and they have raised their price.

The CHAIRMAN: I am sure you will allow me to thank our lecturer for the very interesting paper and the discussion arising from it; and I know the Council are extremely glad to find young Officers who will take the trouble to collect information on such inventions and bring it to this Institution.

Friday, February 10, 1888.

COLONEL C. B. BRACKENBURY, R.A. (Director, Artillery College, Woolwich), in the Chair.

THE PRACTICAL VALUE OF THE WAR GAME.

By Captain H. SPENSER WILKINSON, 20th Lancashire Rifle Volunteers.

THE "Prussian Military Gazette" of March 6, 1824, contained a paragraph which may be rendered in English somewhat as follows:—"The attempt has often been made to represent in a manner at once instructive and amusing the operations of war. These attempts have been known by the name of War Game. There has always been a difficulty in practically working out this conception, and there has remained a very great difference between the seriousness of war and the frivolity of a game. It is worthy of remark that hitherto none but men who were not soldiers have occupied themselves with this discovery, and that therefore by their imperfect picture of war, and their still more imperfect imitation of it, they could never satisfy the requirements of thoroughly trained Officers. At length an Officer has devoted himself during a series of years, with attention, judgment, and perseverance, to the pursuit of this object, and has so far extended what had been begun by his father, Councillor von Reiszwitz, that war is now represented in a simple and life-like manner. Whoever understands in all its branches the conduct of war, can undertake without hesitation to take the part of commander of a larger or smaller body of troops in this game, even if he knows nothing of the game and has never seen it played. If it is worked out on good plans of real ground, often changed so as by a series of fresh dispositions to give more variety, the game becomes still more instructive.

"I shall gladly help with all the means at my disposal to increase the number of existing sheets.

"If First Lieutenant von Reiszwitz has found an agreeable reward for his exertions in the approval of the Princes of the Royal Family, of the Minister of War, and of the superior Officers who have become acquainted with his game, he will, when it becomes known and generally used, assuredly earn the thanks of the Army."

This flattering notice bore the signature of no less a personage than Von Müffling, at that time Chief of the General Staff, and it was soon afterwards followed by a Royal Order, instructing all regiments to provide themselves with the Kriegsspiel apparatus, at the expense of the Budget. The Kriegsspiel was thus introduced under the most favourable auspices into the Prussian Army, where it flourished with varying fortunes during the following forty years of peace. The systems

followed during this first period of the history of the game seem to all have been of the same mechanical type. The earlier text-books are rare, and I have never been able to see those of Reiszwitz, Decker, or Witzleben. But the traditions of Reiszwitz and of the school which he founded may be looked for in the Berlin "Kriegsspieler Verein," which published in 1846 a text-book with the same title as that of Reiszwitz, "Guide to the Representation of Military Manœuvres by means of the War Game Apparatus." Before the war of 1870 two other schools or societies, that of Upper Silesia and that of Magdeburg, had produced similar text-books. The Silesian school is represented by Tschischwitz's "Guide to the War Game," the Magdeburg Society by Trotha, who copies the traditional title.

All these books bear traces of the origin of the Kriegsspiel as a game, the characteristics being that a series of conventional rules are laid down, to be observed in all cases without exception. Thus in all these early systems we find the game carried on by "moves," and every case of collision is settled by the application of definite fixed rules. You calculate the numbers of each side, and thus get a preliminary fraction. Then you look under certain lists of conditions, and find tabulated opposite to those applicable to the particular case some similar fractions. These fractions compounded together result in a ratio by which so many faces of a die are assigned to one combatant, and so many to the other. The die is thrown, and according to the colour of the face that comes up one side receives the denomination Repulsed, Defeated, or Totally Defeated, which means that the pieces in question are turned upside down and considered more or less out of the game for two, four, or eight moves, as the case may be. Another table enables the curious, by the same throw of the die, to ascertain the losses inflicted on both sides by gun, rifle, or sabre. Thus in all these codes of rules the die occupied a very prominent place, while the losses caused by infantry fire, though various plans of roughly ascertaining and noting them are explained, have no practical effect upon the conduct of the operations, except in so far as they diminish in subsequent actions the number of troops engaged. This peculiarity was copied in the handbooks that first appeared in England, both of them dated 1872, and one of them being in substance the rules of Tschischwitz, the other those of Trotha.

After the Franco-German war the Kriegsspiel began to be taken up in Germany with fresh interest. Its position in 1874 is fully explained in a correspondence that appeared in that year in the "Allgemeine Militär-Zeitung," a professional paper published at Darmstadt. Five Swiss Field Officers wrote to the Editor, asking about the War Game in Germany, a series of questions to which answers, written by a German Officer, a pupil of Scherff's, were published.

It seems, according to the evidence thus forthcoming, that after the war of 1866 the War Game had fallen somewhat into disrepute. The rules of Trotha and Tschischwitz were felt to be too unlike the realities that had been seen on the Bohemian battle-fields. Those who continued to cultivate the Kriegsspiel abandoned the attempt to work out combats by its aid, treating it merely as a valuable exercise in

map reading and the composition of orders, or they ceased altogether to treat it as a game, dropped the rules, the dice, and the tables of losses, and considered it as a manœuvre executed under the eye of an umpire, but with imaginary troops represented by the pieces, and with the map instead of the country. The extent of the change which this implies is greater than appears at first sight. In the old game there was really no umpire. The decisions were made by the rules, the tables, and the die, and the person who applied them (called in Berlin and Neisse the "Confidant," and in Magdeburg the "Impartial Referee") was necessary only to make it possible for each party to move without the other knowing all that he was doing. On the old system, the game, with its rules, and tables, and dice, any Officer who took the trouble to get up the rules could act as Confidant or Referee. But when the game and all its rules were gone, and instead there was a manœuvre on the map, nothing could be done without an umpire. No Officer likes his command to be put out of action, unless by some one in whose judgment he has so much confidence as to believe that it would be ridiculous to dispute it. Accordingly it was found that Officers did not join in map manœuvres unless the umpire was some recognized tactical authority. We are told, then, that when the Kriegsspiel began to flourish again after the Franco-German war, the rules of Tschischwitz and Trotha had entirely gone out of fashion, and the free system of umpiring had come in. The War Game had given way to the map manœuvre, and the free system was practised by all the famous umpires of that time,—Verdy du Vernois and his pupil Meckel, Scherff, and Bronsart von Schellendorf. But where there was no famous umpire the whole practice began to drop out of fashion. The attempt was then tried to devise a method which should make the game practicable even when there was no umpire of established repute to be had.

The beginning of this new departure, the first attempt to expound a system which while abandoning the old rules should yet be an instrument fit for the use of the ordinary Officer, was made in a pamphlet called "Studies on the War Game," published in 1873. The author of the Studies was a Professor at the Hanover Kriegsschule, Lieutenant Meckel, who published a few years later when a Major on the General Staff a very important treatise on Tactics. The Studies consist substantially of two essays, of which the first, on the advantages to be derived from the practice of the War Game, the second a criticism of the old rules as represented by Trotha and Tschischwitz. Meckel's view was that inasmuch as the decisive element in modern battles is the effect produced by firearms, that effect ought in all cases in the War Game to be the basis of the umpire's decision. He showed that the old rules, though they gave tables for calculating losses caused by fire, practically decided all engagements without reference to the effects of firearms, except in so far as the number of men shot diminished the number of combatants. He proposed to calculate carefully the losses produced by fire, and to ascertain by this means the physical and moral condition of each body of troops engaged. Upon the basis of this moral and physical

condition of each side the result of a collision was to be decided. "If," wrote Meckel, "the War Game is to give a natural and instructive reproduction of modern fighting, the great power of the effects of firearms must be assigned the same leading part upon the map which it plays upon the battle-field. The chances of battle depend nowadays mainly upon fire effects. In the combat of infantry against infantry it is impossible to determine the chances of the opposing sides unless the effects of their fire are accurately determined. In the decision of every infantry action the first question must be: Upon which side is the superiority of fire? What firing force can the defender develop against the attack? . . . The only combat that does not depend upon the results of firing is that of cavalry against cavalry. Accordingly we must require from the War Game first of all that it shall give us the possibility of determining at each successive stage of an action the effects produced by rifle and artillery fire, and secondly, that it shall base its decisions upon the effects of the firing just as in battle the result really depends upon them." Meckel further demands that the umpire or referee shall "note in a current account all the losses of each unit as they occur, in order to be able at any time to determine the amount of *loss of moral factors* which any unit has suffered up to any given moment. This moral weakening coupled with the exertions the unit has already undergone will be the data from which to ascertain the unit's remaining fighting energy. The fighting energy of the several units must be the foundation for all the umpire's decisions."

Meckel published with his Studies an elaborate table from which to extract with the aid of the die the losses caused by infantry or artillery fire. He distinguished three kinds of games; the strategical, to be played on the General Staff maps, from half-an-inch to an inch to the mile; the grand tactical game, in which bodies as large as divisions should be arrayed on either side, and no detailed calculation of losses made; and the regimental War Game for which he intended his table of losses and his minute calculations. For this game he proposed a map on a rather larger scale than had been customary, $\frac{1}{6250}$ instead of $\frac{1}{8000}$, or 10 inches instead of 8 inches to the mile.

The appearance of Meckel's studies in 1873 marks an epoch in the history of the War Game. The first result appears to have been that the old systems finally disappeared. It is true that in 1874 new editions both of Trotha and of Tschischwitz appeared, but the new editions, though they gave new tables of losses, did not give the effects of infantry fire any more essential place in the game, and apparently they never attained to popularity. The first English official text-book was published before the Studies appeared, and was compiled from a German original published before the war of 1870. It was based entirely on the traditional conception of a game, and became obsolete on the appearance of the Studies. The revised book of rules published in 1884 is a compromise. Tables and rules in the old style are given, with the old fault that if the rules were followed the effect of firearms would have very little influence on the result;

but the statement is made that "Reference to the loss tables should be avoided as much as possible, the tactical situation being the basis of the umpire's decision." This seems to me to contain an admission inconsistent with any high estimate of the value of the book in which it appears. Thus the English manuals of the War Game belong in value if not in date to the epoch before the publication of Meckel's Studies. In Germany there has been since then some progress in two directions. In 1875 Meckel published the first portion of a guide to the game, calling it "Directives for the War Game." He gave a new set of tables for calculating the losses by fire; introduced several improvements into the apparatus, and published a map on the scale of $\frac{1}{6250}$ of an imaginary piece of country.

In 1876 was published General Verdy's "Essay on the War Game," the detailed description of a game worked out from beginning to end. This is the classical example of what I have called the free method of umpiring, and is I suppose one of the best known of military books. In 1877 appeared an essay called the "Regimental War Game," by Lieutenant Naumann of the Saxon Rifles. Lieutenant Naumann's object was, as Meckel's had been, to produce a system capable of employment in societies where there was no famous umpire, no person of unquestioned authority upon tactical matters. He adopted from Meckel the scale of $\frac{1}{6250}$ for his map (which, however, represents actual country) and the two leading ideas, viz., careful calculation of the effects of fire, and determination of the issue of every action upon the basis of those effects. He also tried to ascertain, by comparing a number of regimental histories, the average number of hits obtained at each of the different ranges, which he estimates at about 5 per cent. of the average number of hits made at the same ranges in peace practice. This series of figures, worked out for a Prussian subdivision of a company (*Zug*), he transferred to a scale, placing the figures in four rows according to the closer or more open formation of the enemy fired at, and placing each set of figures at a distance corresponding to the range from the initial end of the scale. The scale so made was of a peculiarly easy and ready help to an umpire in the calculation of losses, for it supplies him at once, for every range, with what may be called the normal average number of hits to be expected in action. This figure is then a safe datum which he can modify according to his view of the special case. Naumann also gave much attention to the question of how the "remaining fighting energy" of any body of troops is affected by the losses inflicted upon it. A company, he says, can lose 15 per cent. of its men without flinching. It must be considered as much shaken after losing from 25 to 36 per cent. according to circumstances, and will be altogether put of action by a loss of 50 per cent. The data thus given by Captain Naumann to assist in the determination of the effects of fire and in the application of those effects to the decision of combats are of immense practical use to an umpire who is not an authority. They were a priceless boon to the Manchester Tactical Society in the practice of its earlier years, when it would have been almost impossible to umpire without the use of "Naumann's scale." Apparently they have been found

useful also in other quarters, for I see that Colonel Bilimek, the careful historian of the Slivnitza campaign, in his exhaustive essay on the conduct of the War Game, adopts *en bloc* both the scale of losses and the calculation as to their moral effects.

With the publication in 1881 of Naumann's second edition, the development of the War Game in Germany seems to have attained for the present to completion, and more recent progress has been in a slightly different direction, to which I propose shortly to call your attention.

Before leaving the historical part of my subject, I may perhaps venture to remind you of the latest official mention of the War Game in the land of its birth. The "Order of Service in the Field," published last year as a substitute for the "Regulations" which had so long been familiar, has prefixed to it an "Introduction," in which the purposes of a soldier's training and the principles which should guide it are briefly set forth. It is almost aphoristic in its concise clearness, beginning with the practical statement that peace training must be regulated solely by the requirements of war. This introduction, aiming at cutting down training to essentials, enumerates the aids to training which can be given by theory. First in the list comes the War Game, of which the writers say: The War Game, *under skilful guidance*, will give plentiful occasion for the study of our regulations, of tactical principles and facts, and will also offer the opportunity of rapidly forming decisions.

Reviewing the principal phenomena which I have tried to place before you of sixty years of the War Game in Germany, we find that the attempt to conduct the practice as a game by the aid of a set of rigid rules broke down with the arrival of modern firearms on the battle-field. The only War Game now found to be practicable is a manœuvre on the map conducted by an umpire; but the umpire is obliged to base his decisions upon the actual facts of modern fighting, and where in this respect his personal authority, his own confidence, or the confidence of his comrades in his judgment is insufficient, it has been found desirable to supply him, not with rules, which are impossible, but with aids towards the formation of a decision. The tendency has been for the regimental War Game to increase the scale of the map and the minuteness with which the details are worked out, while at the same time where an umpire of extended knowledge and mature judgment was available, the combat of large bodies has been practised, and the umpire has been expected to summarize in his own mind the otherwise tedious process of deciding the issue.

In the studies to which I have so often referred of Major Meckel is an essay on the importance of the War Game for the intellectual training of the Officer in the art of command. There is authentic evidence that the views in this essay represented at the time the opinions current among the leaders of German military literature, in particular those of Verdy du Vernois and Scherff. "The object is," says Meckel, "to afford to the regimental Officer who is so entirely absorbed by the practical duties of his profession the opportunity of training himself for his duty as a commander of troops in battle.

Such an opportunity is given him without too great a cost of time or trouble by the practice of thinking over and solving military problems in his mind. The only means, and a very excellent means, of attaining this end is the War Game." Meckel is very anxious to urge the peculiar value of the War Game, for the company or field Officer. He gives a list of seven advantages which he alleges are derived from the practice. The War Game he says, assists the Officer to realize for himself the general nature of the operations of war; it affords constant practice in the composition of orders as well as in their interpretation, and in the peculiar form of discipline which consists in subordinating his own opinion to that of his superior. The War Game is a perpetual study of ground; it necessitates an endless series of tactical calculations and resolves; it is continually teaching principles by their application in concrete cases, and is always, to those who are interested in it, an incitement to fresh study. These seven theses Meckel develops and defends through seventeen pages, and concludes that "the War Game is destined in the future to become one of the most important means of training the combatant Officer." You will, I am sure, prefer to be spared the rehearsal of seventeen pages in praise of the War Game; but I will venture to underline one or two of the advantages claimed.

In the first place, as to the composition and interpretation of orders. Almost every text-book of tactics reads the student a lecture on the importance of clearness, conciseness, the right arrangement in the framing of orders, and the maxim is laid down that if an order is capable of being misunderstood, it will infallibly be misunderstood. The volunteer Officer never has any opportunity whatever of either composing or interpreting orders such as he might be concerned with in the field. Moreover, in the ordinary course of his training, he never receives one syllable of instruction on the subject. For this reason I am disposed to attach a peculiar, possibly an exaggerated importance, to the form of those orders in the War Game which alone are usually deliberately prepared—those emanating before the actual game begins either from the umpire or from the combatants, and to the form of all written messages. In particular, it is desirable to avoid such orders as depend upon future contingencies, at least if the authority giving the order expects himself to remain with the troops that receive it.

The value of the War Game as a study of ground and as a study of map-reading depends of course upon the value of the map. Upon this point, three principles have always forcibly presented themselves to my mind, which I venture to lay before you for what they are worth. I think the map used should invariably be a map of real country, if possible it should represent ground accessible to the Officers who use it, and it should represent all those features which have any tactical importance. A difference of level amounting to 12 or 15 feet is amply sufficient to conceal the movements of any body of troops, and therefore no map can, as it seems to me, be adequate for the purposes of the regimental War Game unless it represents such differences. The German map of Königgrätz gives contour lines at

intervals of 12½ feet, the maps of the battle-fields of 1870 at intervals of 5 metres, the new War Game map of Schweidnitz, published by the Prussian Staff, has contours at the same interval, but the English map has no contours nearer than 50 feet from one another.[1] I cannot help thinking that a great boon would be conferred, at any rate upon volunteer Officers, very few of whom have the opportunity of making themselves acquainted with the country round Aldershot, if the authorities were to provide maps of the neighbourhood of the principal volunteer centres, giving a sufficient number of contour lines. The old 6-inch maps, where they exist, might readily be completed in this way by Officers for their own use. In the Manchester Tactical Society 25-inch maps, filled in with frequent contours, have long been used for a minor War Game, and Colonel Aspland, who took upon himself the labour of surveying and drawing in these contours, has assured me that he found the work of the greatest benefit to himself. I am perfectly certain that very few volunteer Officers have any idea of the amount of information which can be extracted from a map contoured at short intervals, and I know, from experience, that nothing more opens the eyes upon this point than the use of such a map for the War Game, coupled with such aids to its interpretation as Naumann's "measure of visibility." While on the subject of the apparatus I may venture also to suggest that the cost of the pieces at present supplied by the Government might be considerably reduced by reducing their number. The ordinary regimental game does not require more than a few pieces for each side; why should the regiment be compelled to buy two Army Corps?

The principal advantage, however, which is claimed for the War Game is the practice which it gives the Officer in deciding what he ought to do in a given situation. It is not enough for the Officer, when he finds himself in the field, that he should have his head full of what is called "valuable information;" he has to make up his mind what orders he will give, and the more he runs through in his head the doctrines laid down in text-books on tactics, the more he will find himself embarrassed. The particular case in which he finds himself always comes under one of half-a-dozen apparently contradictory maxims; which is he to follow? No text-book and no effort of memory can decide for him, but a sufficient amount of practice in the War Game will make the decision comparatively easy. Even military history, valuable as it is if rightly used, will not prepare the Officer for war unless he has learned to apply it. It is not, however, merely the habit of deciding what can be learned from the War Game. There is no greater source of difficulty to the commander in war than the uncertainty in which he must always find himself as to the enemy's movements and intentions. According to General Sherman, the most remarkable quality of General Grant was that "he was never scared by what the enemy might be doing beyond his sight. He gave his best attention to learning the position, strength,

[1] A very interesting illustration of the great importance attached in Germany to even minute differences of level will be found in the introduction to the third (1874) edition of Trotha's pamphlet on the War Game.

and probable plans of his adversary, and then made his own plans as best he might to foil or overthrow him, modifying or changing them only after it became clearly necessary to do so; but never lying awake of nights trying to make plans for the enemy as well as for himself." The quality thus described, though natural to Grant and probably to all great commanders, may yet be acquired by cultivation. I remember some years ago asking a friend of my own, who shared my high opinion of the value of the War Game, what he thought was the most important lesson learned from that practice, "You learn," he replied, "not to get flurried over what the other man is doing."

The exact expression by which I can best convey to you my belief as to the value of the War Game is supplied to me by a peculiar coincidence. I was reading lately a very valuable essay by Major (now Colonel) von Gizycki, of the Hanoverian Field Artillery Regiment, on the practical use of military history. At the very beginning he puts his finger on what is generally the weak point. "Most men," he says, "set out to seek knowledge only and not judgment." Since that was written in 1881 Colonel von Gizycki has done a great deal of work contributing towards giving military studies their true direction; and as I was preparing this lecture I received a letter from a very distinguished English Officer, commending Colonel Gizycki's work as constituting "the very best kind of instruction—that which trains judgment and not knowledge only." The ideal which the German writer has thus set before himself, and according to a competent English judge has attained, exactly corresponds to the effect of the War Game if carried on in the right spirit. But the spirit is everything, and of the War Game as of nearly every other activity it may be said that a man brings away from it what he takes to it. The Officer who is anxious to learn the secret of the art of command—of "troop-leading," to use the modern barbarism—may learn a great deal from the War Game. But I believe it is necessary that he should come to the game duly prepared. The players require, of course, a knowledge of the functions and method of the employment of the three arms and of the principal formations of their drill regulations. They must also be able to read the map. This is the indispensable minimum required from every player. But even this is capable of several interpretations. Very little is really learned by the perusal of a text-book. The most satisfactory method of getting an insight into the nature of battle is by the close study of some particular battle, which must be taken from recent history lest its lessons should no longer be up to date, and should be studied in the most detailed account that can be obtained, and with the aid of the best possible map. The very best method is to go to the battle-field with map and history in hand. A second useful study, equally necessary to the real appreciation of the methods of handling troops, is to read some of the controversy upon the subject which was excited by the Franco-German War. The German Officer takes his Field Exercise and his Regulations for Field Service, and finds in them the sifted deposit of the tactical experience of all modern war. They are a perpetual guide to him in all his studies, because the best intelligence of the

German Army is employed in keeping them up to the level of the time. The English Officer has no such guide, and accordingly if he really wants to understand is driven to go behind the Regulations and to study the controversial literature. But this study, if carried on in the spirit that seeks not to find fault but to understand, is probably the best commentary on military history, and one of the best aids, if not the best, towards the formation of a tactical judgment. In proportion as the student accumulates the materials upon which his judgment can be based, he should try to find opportunities of exercising it in concrete cases. The War Game is only one form of such exercise. A second, and a very profitable one, consists in the working out of tactical exercises without troops upon the actual ground where they are supposed to happen. A third is to be found in the solution of tactical problems on a map without pieces or opponents, and may well be joined with the study of military history. This is the practice which in Germany now is most closely associated with the War Game.

These, as it seems to me, are the studies out of which the practice of the War Game should arise, and up to which in turn it should lead, the preliminary studies to be pursued by all who may wish to become umpires. It is no longer possible to draw up rules by which the practice can be guided, and the players are therefore now entirely dependent on the umpire's judgment. I am unable to see that the necessary insight into the nature of war can be obtained by any simpler means than those I have described.

But all this trouble would not be worth taking if the only result were that it made the Officer a capable umpire at the War Game. It seems to me worth taking for another reason, that it is, so far as I can judge, the only way by which a volunteer Officer can train himself to be a leader of men. Such a result, the conversion of volunteer Officers into real leaders, appears to me an object of national importance, and likely if it is achieved to be fraught with beneficial consequences the extent of which no man can measure. The time when volunteer Officers were playing at soldiers is pretty nearly over, and most of them are now willing to take pains to become Officers in fact as well as in name. But they do not want to run after a will-o'-the-wisp; and it is not good that they should fritter away time in unprofitable discussions or waste their energies in the pursuit of crotchets. They look for guidance from the leaders of professional opinion. They want the direction indicating by some acknowledged authority. Many of them, however, are deterred from indoor studies by the impression that books, problems, and War Games are not "practical." In opposition to that too common opinion I have put forward a different view. My main contention has been that the War Game, carried on under capable guidance, is an invaluable and indispensable part of an Officer's training, though its value must always depend on the capacity and military insight of the umpire. This conclusion I have endeavoured to present to you as the net result of sixty years of the history of the game in the Army where such studies are most at home. No doubt every man's interpretation of history is determined

to some extent by his own experience, and I may confess that the shape of my sketch of the War Game has been reached through a long series of failures. I have had some experience of how not to do it. Indeed, one of the great merits of the War Game is that it gives us the chance of making mistakes without serious consequences except to our own vanity. But its greatest merit is that it brings Officers together and makes them not only comrades but friends. Many of the happiest hours of my life have been spent working over the map or discussing problems in the field with a small group of brother Officers. For a number of years we have blundered together and discussed our blunders. Little by little we have made up our minds on most of the questions with which as Officers we have to deal, so that the view of the Officer's training upon which I now ask for your verdict is neither untried nor peculiar to myself. It is that of the Manchester Tactical Society.

Major-General G. H. MONCRIEFF: I always find at these lectures that the sooner somebody has the pluck to stand up and begin, the sooner the rest of those anxious to speak follow his example. As President of the Tactical and War Game Society in the home district, I have the pleasure of working a good deal at the War Game. I perfectly agree with the lecturer that this affords a most valuable training for Officers. Our society in London is carried on at the Westminster Town Hall, where we meet twice a month during the winter, and the tactical exercise is generally worked by Officers of the Auxiliary Forces, sometimes militia Officers against militia, and at other times volunteer Officers against volunteers. Captain Wilkinson has alluded to composition of orders, and I should like to say here, what probably no volunteer or militia Officer would like to say of himself, that the composition of orders which have been furnished on the day of the proposed exercise to the chief umpire has been this season marvellously accurate. They have been drawn out in the very clearest way, very often—difficult orders to give out—showing immense attention and very great grasp of the necessary knowledge on the part of the Officers of the Auxiliary Forces. I certainly do congratulate them, as Colonel Hale and other umpires have done, and there is no doubt that it is a very useful practice. We have not yet got in London Captain Naumann's scale, but certainly I hope we may do so, as it should materially assist us in quickening the game. The only difficulty to my mind in the whole question is that it does take a very long time, extending sometimes from five o'clock, with an interval, up to nearly eleven; of course, that is asking a good deal of time, particularly as most of us are busy during the day. The power of reading maps is certainly becoming a most useful and very well-developed matter in the Auxiliary Forces. I shall never forget many years ago an Officer in my own regiment—we were on the march—I had my map, and was looking at it. I said to him, "I wonder where we are now?" "Oh," he said, "I do not know; I never could read a map in my life." Well, he has learned to read a map since, and is a very good Staff Officer now, but it really did strike me at the time as being very odd. It might amuse you to know how I once saw a War Game played in Dresden. I dined with the Grenadiers of the Guard at six o'clock, rather a long dinner, and a good deal of tobacco was consumed afterwards. When I left at about nine o'clock, I was amazed at seeing the War Game had been produced, and I was told that the Subalterns of the regiment and one of the senior Officers amused themselves in that way after a rather long mess dinner once or twice a week. I do not know what the Officers of our regulars would think about that, but I can hardly believe it being a very successful study under such circumstances. In conclusion, I will add that if anyone comes to Westminster Town Hall, we shall be very glad to show them what we can about the War Game.

General Sir ROBERT HUME: I think there is not the slightest doubt that the War Game is of the greatest use, especially, as the lecturer has said, to the Officers

of volunteers, and those who serve at home; but the War Game as played at present, I imagine, is only applicable to European wars. I do not know if it has been in any way adapted to the study of wars such as we are usually engaged in. What I mean is whether it would be possible to compile a War Game that would be applicable to some of the circumstances in which we English practically find ourselves when engaged in non-European wars. It would certainly, to my mind, be a very useful thing if anything of the sort could be drawn out that would be at all applicable to the circumstances which we practically have to deal with; for I imagine that however much we may learn as to the proper way of leading troops in large European contests such as we read of in the books of tactics that we study, particularly the German books, still those are circumstances with which we may never have to deal, and so I think it would be a very good thing, and I should think that General Moncrieff probably might assist in carrying out the idea I wish to put forward, to have something in the shape of a War Game which would be of practical use to us in our everyday fighting—would be of more use to us as soldiers and to the younger Officers than the present War Game, useful as it is.

Colonel MAURICE: I think I may venture to say that it seems to me that if the Kriegsspiel will give us, as it undoubtedly does, the habit of following movements of troops upon ground, and following the movements of troops upon maps, and bring those two in relation to one another, that would be equally applicable to our small wars as to Continental warfare, and that as it happens the relation of maps to ground becomes particularly important in reference to our small wars, because usually we have to make our maps expressly for them, and thus it becomes extremely important that we should become well acquainted with the relation which the maps actually bear to ground, and should apply to them such corrections as experience teaches us are necessary. The very best point connected with the War Game seems to be this, that a man who is working one of the sides with a number of subordinates under him sees and feels for himself the difficulty of issuing a set of orders so constructed that when they get to his subordinates they shall be so clear that his subordinates shall know exactly what he intends them to do under all circumstances which may occur, and yet shall not so tie them as to prevent them from exercising their discretion where their discretion ought to be used. The War Game, if properly carried out, makes a man think for himself. We learn, as I have said, from our own mistakes, and also from the annoyance and irritation which constantly attend one in seeing subordinates carry out, in quite a different way from what had been intended, such orders as have been issued. Practice in receiving and issuing orders, so that they get to be rightly interpreted, is certainly an experience which is as applicable to our small wars as to any Continental wars, and it connects itself with that kind of training for military operations, learning to play one's own part in a large whole, which is after all the most important element connected with modern war; and which would be applicable to our small wars as well as to Continental warfare. I do not myself see how it would be possible, with the class of small campaigns we have usually, to get an area of ground so limited as to make any actual fighting conveniently apply, or to construct maps that would be available for the purpose of our small wars, for this reason, that in almost every separate campaign in which we are engaged there are conditions distinct from every other campaign. It therefore appears to me that you would get much more value out of the game if you are able to compare the wars of which we have the fullest and most complete accounts on the Continent, with the experience of the Kriegsspiel in relation to moving troops, than you would from the accounts that we are able to give of our small wars. In conclusion, I hope that Captain Spenser Wilkinson's lecture will attract attention generally to the most admirable history of the Kriegsspeil with which he has supplied us in one of the Manchester Tactical Society's papers, and I may state generally that the body of papers published by the Manchester Tactical Society are such as, I think, any Officer in the room would be delighted to read, and I am sure very great credit is due to them for the work they have so done. I can only for myself speak of the instruction which I have got from Captain Wilkinson, from the knowledge which he has of German work and German experience, not only in relation to that particular history of his, but also to other matters, such as the continual application which he has been able to give for

a number of years to following up what has been done in Continental armies, the study of which must be very valuable to any Officer who follows it up. It is also one of the instances of the great assistance that we get from volunteers that we should receive such a paper from one of themselves as we have heard to-day.

Mr. COPEMAN, Norfolk Rifle Volunteers: There is only one observation I wish to be allowed to make, and that is with reference to the difficulty, which has been referred to by one of the speakers, of reading maps. I consider it a particularly difficult operation, especially to some people, and it requires a certain amount of experience in it before one can approach the ground properly with a map in one's hand. I think we are losing an opportunity practically afforded by the manœuvres carried out among volunteer regiments, when the Officers are not as a rule supplied with maps, so that they can educate themselves as to their use upon those occasions. I know that some of us take out scraps of the Ordnance Sheets, and try to pick our way about with it, and make out as well as we can the operations that are being carried out; but if the War Office would issue maps on thin linen or paper, as I believe they do to field Officers, to every Captain, and perhaps to every Subaltern engaged in the manœuvres, it would be a very great assistance to them in mastering the subject.

Colonel LONSDALE HALE: I owe, Sir, some apology to my friend Captain Spenser Wilkinson, on private and personal grounds, for my not having been present at the reading of his lecture, but my absence was unavoidable. The lecture, so far as I read it, throws an amount of light upon Kriegsspiel generally which we had not available before, and gives us another view of the way in which Kriegsspiel may be conducted. There are, however, many ways in which Kriegsspiel may be conducted, each of them having their own particular merit, and I cannot help thinking that the way in which we conduct Kriegsspiel in this district and in the south has advantages equal to those which are held up as so excellent by Captain Wilkinson. I do not intend to detain you long on the present occasion, but the fact is, my friend Captain Spenser Wilkinson unknowingly made an attack upon me elsewhere in connection with Kriegsspiel, with the only result that I had the pleasure of numbering a fresh name among my friends, and that in this same lecture he has made another attack on me, probably also unknowingly, and this compels me to reply to some of his remarks. I am perfectly willing to accept his onslaught, and meet it to the best of my power. Captain Wilkinson has published a most excellent pamphlet, entitled "Essays on the War Game," they are very different indeed from the lecture, because in the essays he showed us how the Kriegsspiel ought, in his opinion, to be conducted, and he has not quite entered upon the same details this evening. In that pamphlet he found fault with certain ways in which a particular exercise had been conducted as regards the framing of the "ideas," and to-day he has to a certain extent gone at our official rules for the conduct of the War Game, which were issued in 1884. In the preface, or in the prefatory remarks, my name occurs, mentioned in far too complimentary language, but I had nothing whatever to do with drawing up these "Rules of the War Game;" but the Committee thought it fit to summon me over to Aldershot to conduct an exercise in their presence, which I did. The result was, that the Committee embodied in these rules a very large number of my own suggestions, many of which I recognize. Well, I would have willingly given up every single suggestion which they did embody if they only embodied, as they have done, one in particular, and that was, "Reference to loss tables should be avoided as much as possible, the tactical situation being the basis of the umpire's decision." Now, I would have given up everything so long as they inserted that one particular recommendation, and of that my friend Captain Wilkinson writes as follows:—"This seems to me to contain an admission inconsistent with any high estimate of the value of the book in which it appears;" that is to say, he thinks the book worth nothing very much, because my particular recommendation is in it. That recommendation is just the whole principle upon which we carry out Kriegsspiel in this district. We decline to go into this question of losses which, so far as I understand Captain Wilkinson's lecture, is the very basis of the German "Regimental War Game," and of Meckel's system. Everything in that exercise depends upon the destructive power which is assigned to the weapons used in that exercise, and that is one of the most purely conventional estimates that could

possibly be drawn up. He tells us that some German Officer went through regimental histories, and found out what the effect of shots were at the different ranges. Colonel Paul Methuen and I have been through a good many of these, and we should, I am sure, have to look far into them to find anything whatever to throw light upon the subject. Where on earth Lieutenant Naumann got the notion as to the amount of cartridges fired, and the effect of different shots at different ranges, is simply inexplicable, and I do not believe in its reliability for one moment. He has simply drawn up some system of averages, and you may give a system of averages for everything; but it is purely and entirely conventional. The whole essence of this subject is that the carrying out of the exercises depends upon the losses. Those of us who used to work at Kriegsspiel many years ago will remember what that sort of loss business was, eventually resulting, after prolonged calculation, in the loss of half a man, or something of that kind. I do not understand these tables which appear in Captain Wilkinson's "Essays on the War Game," but I see half a man is allowed for those at some ranges, and the question is, is it worth while to go into all these things in carrying on Kriegsspiel? It is not the view of Colonel Methuen, Colonel Cooper King, General Moncrieff, Colonel Stirling, myself, or of others, with regard to carrying out the War Game; it is not merely our own dogmatic idea that we can do without these losses, but we have on our side the writer of this little book I hold in my hand, Verdy du Vernois. His system of Kriegsspiel ignores altogether losses. There is no greater name in Germany, with regard either to these exercises or tactical exercises generally, and therefore the name under which we shelter ourselves, if we want to do so, is sufficient; only we adopt V. du Vernois' system as a matter of common sense, and more applicable to the English Army. General Verdy du Vernois speaks, in the preface to his book, which has been translated by Major Macdonald, in this way. He is speaking about these rules and the use of the dice and tables of losses: "It is indeed only by severe toil and a great expenditure of time that any one who has not learned the game by actual practice can, through unassisted study of the books of instruction, so thoroughly master the subject as to be competent to conduct the conduct of an exercise of this kind. So it comes about that there are assuredly in the smaller garrisons many Officers who should be especially fitted from their position to take the matter in hand, who utterly shrink from doing so;" and it is this terribly monotonous work in carrying out umpiring at Kriegsspiel that has kept so many Officers of the higher ranks from undertaking that work. They have not looked upon it simply as a tactical exercise, but a game carrying with it a great number of rules and calculations. "I in no way underrate the service which the recent books of instruction, with their rules, their dice, and their table of losses have rendered, and will render in the future. It consists chiefly in this, that the umpire finds in the rules fixed principles by which to limit the capacity and fighting power of troops, and define that the effective use of weapons gains full credit by means of the tables of losses, and that dice, which gives to chance its due influence, provide an apparent security against partiality in the decisions. The question, however, arises whether the game might not be made even more useful than it is if the difficulty of execution and the expenditure of time which the ever mechanical divisions involve could be avoided." That we all wanted to do when we began to umpire; we wanted to get rid of all this dreary monotony. "Experience shows that this question can be answered in the affirmative." And then he proceeds to speak of the instructive excursions which are carried on over the country by certain Officers of a garrison, just the same as those who work a Kriegsspiel. "It has never been found," he says, "needful in these excursions to settle the requisite decisions by the chance of dice, the umpire gives it according to his own views; neither is it thought necessary to investigate in the closest detail the effect of weapons. It is found sufficient to arrive at the general conclusion that one body has suffered certain severe losses, or that it has been so shaken that its fighting power is substantially weakened, and whether on the whole it is in a condition to continue to advance under the enemy's fire, or to maintain its position," and therefore, at one fell swoop, General Verdy du Vernois sweeps away all this calculation of losses. And then he goes on to say, "You may carry on Kriegsspiel as you like; you may use small maps or you may take Meckel's system and use your tables," but he says, "You can also use my way,"

which is the identical way that Colonel Methuen, Colonel Cooper King, General Moncrieff, Colonel Stirling, and myself have been conducting for a long time. We have simply, without perhaps knowing it, been following Verdy du Vernois' method, and which makes Kriegsspiel far less wearisome and far more acceptable to the British Officer than it was when you had got all these calculations to carry out. I only hope that in the course of this discussion some of those who have taken part in Kriegsspiel will bring out some of the difficulties we meet with in carrying it on, difficulties connected with cavalry scouting and so forth, so that Captain Spenser Wilkinson will be able to tell us in his reply how these difficulties are best dealt with.

Colonel METHUEN: I feel rather like one of the gentlemen in the triangular duel in "Midshipman Easy," because Colonel Hale is a particular friend of mine, and so is Captain Wilkinson, but I am forced to disagree. I think that Colonel Hale's attack is a little unfair, because I understand Captain Wilkinson to say that when you have a man who can do the work of the umpire in the way that Colonel Hale can do it, with a light heart, then by all means adopt the way Colonel Hale proposes. Captain Wilkinson says it is not everywhere you can find a man who can act as umpire, and in that case you must fall back on the hard and fast rules. I have had the good luck to see Colonel Hale working, and having done my best to imitate him I find it most wearisome to conduct the War Game as carried out in the way Colonel Hale has found fault with. It is extremely difficult to umpire at any time, so as to make the game go smoothly. For instance, take the cavalry vedettes, unless you say to both sides at once, "You recollect that a cavalry vedette may have 800 yards circle round him, and see all that he can over in that 800 yards." One saves a vast amount of time and disputing as to what a vedette can see and what he cannot see by this system of umpiring. Then another thing is this, I think that the assistant umpires require immense instruction. I find an assistant umpire comes to me and says, "I shall be most glad to assist you in every way, but this is the first time I have done anything of the kind." That is to me absolutely hopeless. What, I think, should be done in these games is that the assistant umpire should meet the umpire, say, an hour before the players come together, and you should move the troops on both sides forward, let me say thirty or forty minutes, till they come into contact, and then let the players commence. I myself have done that, and have found it saves a great amount of time. Then there is another thing I find, which is this, that you give a Division to people who would never probably command more than a battalion. I think that is a mistake. My idea of Kriegsspiel is to give a man who is likely to command a battalion or a brigade, a brigade command. It is no use giving him a Division or an Army Corps. In Berlin the Kaiser's Franz Guard Regiment play week after week their War Games. We used to play the War Game and have supper afterwards, and a friendly game it was; but if I remember right, they worked their Kriegsspiel with far smaller numbers than we have seen it worked here. I went to Manchester last year, and I can speak, as others have spoken, of the immense good that the Manchester Tactical Society have done, the immense interest they take, and the immense amount we have learnt from the most excellent pamphlets which have emanated from that Society.

General MONCRIEFF: I will not detain you a minute. I only wanted to mention that Lieutenant Sharpe, of the 3rd Middlesex Volunteer Regiment, has published a most excellent set of maps, very clearly drawn and coloured. Of course, although, as the lecturer says, it is of the greatest importance to have maps of an actual piece of country, still there is no doubt that when you have worked battles over this piece of country for a considerable time, you sometimes rather want a change. Lieutenant Sharpe has invented a set of maps, so constructed that you can put any map in any possible position on the entire square plan. Each section has roads running out on each side at the same intervals. In one position a little bit of a road may only end in a farmhouse, in another position it may run right through the map; the consequence is you can vary your ground, and the umpire simply has to send with the little sketch plan of the game that he has decided upon, the order in which he wishes the sections of the map to be placed. These maps should be particularly useful for militia or volunteer battalions, who cannot

afford to buy maps of various pieces of country; if they buy Lieutenant Sharpe's set, they have an actual piece of country to start with, and can vary it indefinitely. There is also a considerable sized river, which can be put between any line of sections, or at the top, bottom, or sides of the map.[1]

Colonel LONSDALE HALE: Allow me to say one word with regard to what Colonel Methuen said just now. I am rather tired about hearing what has been said about my umpiring at Kriegsspiel. The difficulty of finding an umpire is simply owing to the fact that Officers will not look upon it as a tactical exercise. Now I do maintain theoretically that any single field Officer in the service who might be called out at Aldershot to-morrow to take command of a small force of the three arms, if he is fit for that duty, can very well, with the aid perhaps of a little help in map reading, take charge and umpire at an exercise at Kriegsspiel.

Captain SPENSER WILKINSON: I must confess I am a little astonished at what Colonel Hale has said, because I thought I had tried to convey, with regard to the English rules, that if these rules were followed, the effect of firearms would have very little influence on the result. They also contained the statement of which Colonel Hale claims the authorship, that "Reference to the loss tables should be avoided as much as possible, the tactical situation being the basis of the umpire's decision." That appeared to me to be perfectly right, and I say that when you make that statement, it would seem to destroy the value of the rest of your book, with its tables of losses and its other series of tables. What is the use of publishing a book with the old style of rules, and then saying in your book that you do not want to use them? I think it would have been a great deal better if Colonel Hale's part of the book had been retained, and the rest had been abolished. Colonel Hale asks where are the regiments from which Captain Naumann took his figures? There is no difficulty in answering the question. I will, if he wishes, read the whole list. With regard to any historic fact, especially with regard to war, where is there any single fact at all for which you have anything except doubtful information, and for which you have certain testimony? I suppose nothing is more difficult than to ascertain actually what the effect of firearms has been in shaping any particular battles, and there I quite agree with Colonel Hale; but, at the same time, I shall be very much astonished if Colonel Hale does not say that the next time we go to war, firearms will decide the battles one way or the other, and that the result will depend not only upon the training of the troops, but also on the process by which the Officer prepares himself to train troops, and tries to frame in his mind a certain number of principles on which he afterwards proposes to act. It seems to me the chief factor will be the Officer's view as to the effect of modern firearms, and that he will try to get some idea as to what the effect of firearms will be. If you will allow me to put it for a moment in a sort of personal way, I should say if I have a company, and if I am going to take my company into a sham fight, my first business is to say to myself when I see an enemy, "Supposing these people were firing bullets, where would those bullets go, and what should I do to get my men out of their way until my company is wanted?" I can only have a notion of that by having thought a good deal about the use and effect of firearms, not merely what you get in the old-fashioned Red Books about trajectory, but as regards the effect of a large number of rifles being fired in a particular direction. With reference to the surface of the ground, the questions about the effect of the fire appear to me to be enormously important, and one of the principal things which the infantry Officer has to learn is the real effect of firearms. In what way is this to be learnt unless as far as you can you go back to the history of previous battles? My whole contention is that if you can get Colonel Hale to umpire, you do not want any book or any theory at

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[1] The cost of these "Interchangeable War Game Maps" is as follows:—

3 complete maps, on millboard, coloured and varnished ..	£3 3*s*.
2 boxes blocks (red and blue) with four scales and dividers ..	£1 1*s*.

Address: Lieutenant S. Sharpe, 3rd Middlesex Rifle Volunteers, The Grove, Hampstead, N.W.

all. In our own Tactical Society, when we have been so fortunate as to get umpires—and I may say we have been fortunate once or twice; on one occasion Colonel Brackenbury himself was good enough to umpire for us—we certainly did not say anything to him about fire scales, we were only too delighted if he would umpire for us in any way he liked, and we would be delighted if Colonel Hale would do the same. But if Colonel Hale says that any volunteer Officer is to umpire, and ought to be able to umpire, without mechanical aids, I join issue with him. Very few volunteer Officers are qualified, and, as far as my observation goes, nothing is so disastrous as volunteer Officers professing to do it when they cannot. What I have tried to put forward is that so long as it is a mere question of rules, which can be worked out by machinery, and I have seen War Games played in that way come out very well; as long as it was mere rules, you did not want an umpire; but when it is manœuvres on a map you must have an umpire whom everybody trusts, some one, like Colonel Hale or Colonel Brackenbury, some good umpire whose word for volunteers is enough. But if it is one volunteer in a regiment umpiring for the others, the players will say, "We should like to know why he wants us to retire. He had better find a reason." That is my own practical experience, and when I look at the history of the game, I say that is the experience of the game in general. With regard to Naumann's scale, Colonel Hale says he does not understand it. That is probably my fault, but, I think, when we come to the Kriegsspiel, at which he is going to umpire, I shall be able to make him perfectly well understand Naumann's scale, and, I think, any Officer who sees it will agree that it is a useful thing to a person who is not an authority. Verdy du Vernois says, "I will in no way refuse to recognize the value of the old tried guides to the War Game, with their rules, dice, and tables of losses. It consists mainly in this, that the umpire finds in the rules fixed regulations which give the limits of what the different armies and the different troops can do." That is exactly what a volunteer wants, some boundary lines fixing the maximum and minimum of probable losses. That is the object of what I have called the mechanical aids, among which the fire-scale is the most valuable. The umpire must say to himself, "The effect of that firing is so and so on those men." He does not necessarily say twenty-five men are killed or half-a-man is killed, but he says, as Captain Hale says, "This fire under these conditions will not produce such serious loss as to cause the company to retire," or "The losses by fire are so serious that the company will retire in confusion;" but surely even Colonel Hale's decision must be based upon the losses. I understand that any decision of an umpire is founded upon what he believes would be the effect of the fire. All that we have to do is to try and find something which will help the volunteer where he finds it necessary to try to umpire. I should like to refer Colonel Hale to a comparatively recent book on the War Game, by Captain Bilimek, in which there is an essay called "Limits of Reckoning the Losses." Colonel Bilimek says what you want is not to calculate half-a-man or two men; these minute losses are only wanted on very rare occasions, and you may practically ignore them, even though given on Naumann's scale, but you do want something to tell you whether the company under fire is shaken or not. I know no other way by which an Officer in the position of most volunteer Officers can settle that, except by some authoritative table or scale. Colonel Methuen said, "Why do you give a man a Division?" The English map is on a scale of six inches to a mile. It is not a scale on which you can work out things in very great detail. In the Manchester Tactical Society we used at first to take very small forces, we never went above a battalion, and we carried on the engagement on the six-inch map; but the moment we came to the detail we found it impracticable, because the map was not on a large enough scale. It is constantly the case with a six-inch map, that you cannot settle enough detail to decide the actual fighting of small bodies; and, therefore, you are driven to renounce the attempt to go very minutely through the actual fighting. As soon as the detail of the fighting is abandoned, the larger units acquire a far greater interest than the smaller ones. When you once get practice in manœuvring, you very soon want to have a Division, or two Divisions, because the divisional commander is the first commander upwards in the scale who has sufficient responsibility and initiative to make the player independent. Moreover, it is very hard to invent

an idea for a very small body which shall be natural and like something in war, and yet shall give the player a real initiative. I agree with Colonel Methuen as regards the assistant umpire. We have always found it is not the slightest use any man trying to be assistant umpire unless he has had a little practice; this work has to be learnt, or else the umpire cannot rely upon his assistants. I believe if Colonel Brackenbury were to tell the truth of what he saw at our Society he would say the same thing. Colonel Maurice alluded to the difficulty of composing orders. It seem to me that the practice in composing orders and writing them is almost the greatest benefit that the War Game gives. The Officer gets an enormous amount of practice in making up his mind, and very carefully expressing himself, so that the subordinate is not too much tied, and yet is likely when occasion arises to do the right thing. I thank you very much for the kind way in which you have listened to me, and I can only apologize for the very rough form of my lecture.

The CHAIRMAN: We shall all heartily agree that we have not only had an extremely interesting lecture but a valuable discussion, which is exactly the object aimed at. It is not for me to detain you after all that has been said much better than I could say it, but there are just one or two little points on which I may ask to be allowed to say a word or two. General Moncrieff very wisely touched upon the point that we English do not take life in quite the same way as the Germans do. Now, I happen to have seen a War Game played in Berlin, and the patience displayed was, as the Germans themselves would say, simply colossal. We could not match it here. On the first occasion when I ever commanded a force in a War Game, I was given a whole army corps, and my opponent had an army corps also. We were placed a long distance from each other, he at Reading, I at Aldershot, and the result was that we fought for a week, and during that week I cannot say that I ever had a comfortable night. Generals are not very much in the habit of fighting for a whole week in the same battle. Certainly I have seen operations which have lasted during three days of steady fighting, but even then they slept at night, which was more than I was capable of doing. That was perhaps owing to want of patience. It happened to me during the 1866 campaign to see a Saxon cavalry regiment move off to the fight, and as I approached them they had the appearance of an enormous brass band. When I got close I found that every man had a long pipe in his mouth, which looked like a musical instrument. It may be these pipes that give them the patience, but the result certainly is that the German has an amount of patience which we cannot imitate. There seems to be a general agreement as to the supreme value of the War Game as a means of tactical instruction and practice, not only involving knowledge but all the qualities that make a man a good soldier, probably the same qualities which make him a good everything else. He acquires knowledge of ground, and of time and space in a military sense, decision of character, and a great many other military faculties which are valuable, and which he has the opportunity of exercising in the War Game. Captain Spenser Wilkinson was kind enough to speak of my going to Manchester; on which occasion, by the way, I wrote beforehand to request that the umpire's verdicts might be absolutely taken as final without any controversy. I was very much struck by the decision, the coolness, the want of flurry in the Officers who played. Nobody seemed the least anxious; they certainly smoked cigars and pipes as the Germans do, and perhaps that has something to do with keeping the nerves steady; at any rate, the steadiness was there, and I can only suppose that it was brought about by the constant practice which the Manchester Tactical Society have in the War Game, and in the tactical studies which relate to it. We all agree that the War Game is specially useful as a means of acquiring tactical knowledge, and developing those various points of character which have been mentioned. But some Officers fancy that the game is theoretical, and that it does not give as much practical instruction in war as there ought to be. Well, you cannot have real war every second day for Officers to learn their duty, and all they can do is to get the nearest attainable approach to it. The nearest approach of all will be found to be tactical manœuvres on the field, and when we cannot have that, then tactical manœuvres on a map, which also give immense practice in that most useful and necessary knowledge, the reading of maps. Men must study nowadays, it is no use pretending. An Officer may be an excellent drill in the barrack square, he may not get his company or

regiment or battalion, or whatever it is, clubbed or turned inside out, but he is not therefore an Officer skilled in the movements of war; he may indeed know nothing whatever about such movements, and yet be what is called "a very good drill." We find that all the best Generals have been students of war. It does not follow that a student is a great General, but I do not think anybody can be a first-rate soldier unless he is both a thoroughly practical man, a man of character, and a student as well. Nor is it the General alone who must study. The youngest Officers in these days have to learn to be tacticians—there is no question about that. Then, again, it is not only the War Game itself which is useful, but the discussions to which every game gives rise. Men say, "So and so, what a fool he made of himself"—"No, he did not." Then a discussion arises at once, and technical knowledge is thereby developed. Certainly, this question of umpires which has been discussed is a very interesting one, and I really do not see that there is much difference in opinion. It seems that the understanding between the gentlemen who have spoken is that as long as there is somebody who is a thoroughly good tactician, who is well acquainted with the War Game, and in whom everybody has confidence, you do not want any rules at all. You say to him, "Judge, speak, we all obey." But when Officers are playing among themselves, they have a little hesitation about laying down the law to each other, and the result is that you require some kind of measurement or calculations to say what are the losses in a general way, and whether a company is likely to have suffered so much that it cannot go on with its work as before. For that purpose the simplest means that can be found would naturally be the best. The want of patience which exists among ourselves certainly leads us not to be able to work the War Game on quite the same elaborate scale that the Germans do. At any rate, we want to see something more lively than they do. We like to have the thing quicker, to have something more for our money. In connection with this, I should like to call your attention to the arrangement which was invented by Captain Wilkinson Shaw. When he was a Garrison Instructor at Aldershot, he designed a most beautiful model of the country on a very large scale. The players were at the different corners of the room with their maps; they played on those maps, but the audience were looking at the model, and the assistant umpires placed pieces on the model showing what was being done on the maps. It was very much more interesting and more like reality to the spectators. The model being large there was not so much crowding round it, and altogether the spectacle was more vivid and enjoyable. That was a little invention of our English own, and I do not see why we should always in everything follow exactly what is done by other people. There is a complaint, how far it may be true I do not know, but it is said that we do not take interest enough nowadays in military work. Certainly, we take more interest than we used to do, but, no doubt, we might take a little more, and I hope we shall do so. Why is it that so little interest is taken in military affairs? It must certainly be because we, unlike the Continental nations, believe that war is far from us, and very likely will never approach us; that we shall never have to do any fighting in the Continental sense—that is to say, none of us will ever have to oppose an enemy who is a thoroughly skilled leader of troops. This is rather an unfortunate thought if it leads us to carelessness in military affairs. There is a sort of principle we all know, in which anything that is distant is forgotten, is not cared about. Now, we read the other day that in China there was an accident; a river burst its banks, and by its overflow four millions of people were drowned, and some two millions more rendered houseless and desolate. We do not think as much about that awful catastrophe as we should if a Bishop were killed in a railway accident in England. It is all very well to say, "We think about what concerns ourselves; we are not Chinese." But neither are we Bishops, and I do not know that any of us here are very likely to be. No; one accident is far off, and the other is near. And we think war is far off, and, therefore, Officers allow themselves to say, "It will never be my chance to have to lead this, that, and the other; and why should I worry about the War Game, or anything else?" That is a very unfortunate state of mind to get into, and I hope it is one which we are getting out of as fast as we can, for, in truth, war may be nearer than is generally supposed. I have now the pleasant task of complimenting Captain Wilkinson in your name for the most admirable account which he has given us of the commencement of the War Game,

its history as it has progressed, and its state at the present time in the country which we are generally accustomed to consider the leading military Power. He has devoted his time in a most praiseworthy manner to the study of this question, and he has kindly brought his whole knowledge to bear upon the lecture which he has given us, for which we all return him our grateful thanks.

UNDERWOOD'S COMBINED PICK AND SPADE.[1]

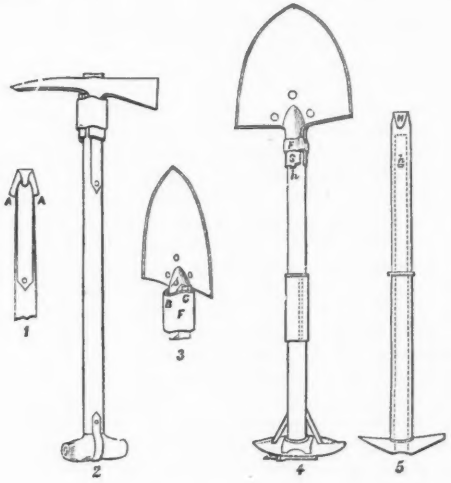
MAJOR UNDERWOOD, after showing the method of fastening the tools and the manner of wearing them, remarked that late wars, especially that between the Russians and Turks, had incontestably proved the paramount importance of every infantry soldier carrying a spade, indeed General Brialmont in his great work on the Fortification of the Field of Battle goes so far as to say that in future wars, a man without a spade will be only half armed. After pointing out the advantages of the cavalry weapon in being considerably lighter and more easily carried than the tools now in use, besides combining an axe, spade, pick, and heel peg, Major Underwood expressed himself as strongly opposed to pioneer tools being carried either by pack animals or wagons, and he quoted from a portion of Captain Frazer's Prize Essay of 1879, published in vol. xxiii of the Journal, in which Captain Frazer says, p. 360 :—It is plain that the use of intrenchments requires that at the *shortest notice the means be always present at the right moment* and the right place ; after stating the alternative methods of carrying the tools, he conclusively proves by numerous examples from recent wars that the tools should be carried by the troops themselves. Major Underwood then pointed out the objection he had to the Wallace and Linnemann systems, and that in actual trials, his spade had easily beaten all others, and that owing to the extra 6 inches of length this was always sure to be the case.

Finally, he claimed for his tool the following advantages over all others :—1st. Superior lightness, being only 2 lbs. 3 ozs., and saving the weight of the scabbard 8 ozs.; 2nd. Fewer things to look after; 3rd. No screws or anything liable to suffer from rust ; 4th. Extra length—27 inches—Captain Frazer in his essay states that length more than size affects digging power ; 5th. The security it gives in protecting the soldier's vital parts when rushing to the attack ; and 6th. Saving in price, the whole tool being nearly as cheap as the regulation scabbard at present is.

Figs. 1, 2, and 3 represent the cavalry type, and Figs. 4 and 5 the infantry pattern. In the cavalry type, a wooden shaft is employed, having at one extremity a steel head, H, with side projections, AA, the head being inserted into the socket of the pickaxe or shovel. The fastening is by means of a ferrule, F, provided with two grooves to allow the projections A to pass. When right home the ferrule is turned, and its sloping edges, B C, engage with the projections on the head of the shaft, thus making it fast in the sleeve S. The weight of the tool, with leather frogs and cases, is 4 lbs., and the shaft may be used for tethering the horse. The shaft of the infantry tool (Figs. 4

[1] Exhibited at the Meeting on 10th February, 1888.

and 5) is a light hollow steel tube, which forms a scabbard for the bayonet, and at one end of which is a solid welded steel pick. This serves as a handle when the spade is fixed to the other end H, in which case protection is given to the hands by the leather covering by which the shaft is suspended from the soldier's belt. The spade is attached by means of an oval ferrule, F, which, sliding over the tapered sleeve S, forces tags into the holes *h*. The spade can, by straps attached to its leather cover, be hung from the chest buttons of the tunic, and, owing to its having an oblique face and being made of steel, has been found capable of resisting rifle bullets at ranges over 200 yards.



Friday, February 17, 1888.

GENERAL THE RIGHT HON. VISCOUNT WOLSELEY, K.P., G.C.B., &c., &c., &c., in the Chair.

THE ADVANTAGES OF A SIMPLE DRILL NOMENCLATURE CONSISTENT FOR ALL ARMS, APROPOS TO AN INCIDENT OF THE BATTLE OF TEL-EL-KEBIR.

By Colonel J. F. MAURICE, R.A. (Professor of Military Art and History, Staff College).

THE subject which I am to bring before you to-day is a very simple one. I think it is also a very important one. We all of us recognize that we are in a new phase of warfare. I hardly think that we have any of us as yet fully realized all the changes which the new condition of things involves. I speak for myself as much as for anyone else. It seems to me that it is very difficult for us to emancipate ourselves from long engrained habits. Military training would be of very little use if we could. For avowedly it is the great purpose of all military training to create for the soldier a second nature. When, however, change is forced on us, and we have to consider how we can best meet the changed conditions of war, it is clearly possible at least that some of those very habits which were in our military childhood wisely instilled into us may interfere with our seeing things as they are now in their true light.

I have lately been very much struck by the advantage which we in England possess in this respect from the existence of our great Volunteer organization. Numbers of men of a mental training the highest which our great Universities can give, have patriotically devoted themselves to the dull drudgery of drill. They are for the most part very modest. They rather than any others of our countrymen realize the enormous advantage of the highest military training. They less than any others of our countrymen are disposed to think that it is a mere freak of Nature when some man arises amongst us who is able brilliantly to command armies in the field. They better than any others understand how largely the gifts of Nature must be supplemented by thought, by labour, and by strictly warlike experience.

Nevertheless, coming with unbiassed minds to the consideration of the military problems of the day, they have at least the advantage of those onlookers who are said to see more of the game than the players. I should of course be very sorry, they would themselves be very sorry, if they were appointed to decide what changes ought to be made in our modern preparation for war. But, though soldiers must decide, it will greatly aid their decision if they will take account of the

criticism of cultured Volunteers, many of whom are now engaged in most careful study of the conditions of modern war. I can answer for it that I myself have received the greatest benefit from the fresh thought and independent views which have been brought into some aspects of the military problem of the day by Volunteer work. Notably, I do not think that a more valuable series of papers have for some time been issued from our military press than those which are now being published by the Manchester Tactical Society. Of course here and there I find opinions from which I differ, and occasionally I should like to suggest to some of the writers, as a matter of military discipline, a less aggressive tone in referring to the decisions of military authority. It is the side on which they are likely to err. The error is an important one. Nevertheless its very nature tends to serve our turn in so far as it deals with a freshness which would be unnatural to us with questions which it is important that we should consider.

Among the papers recently published by the Manchester Society there is one to which I desire to refer as the best account I know of the history of English drill. I should be very glad if I could persuade every one to read it. It is entitled "English Drill—A Historical Sketch," by J. L. Aspland, Lieutenant-Colonel, 20th Lancashire Rifle Volunteers.

Now I think it will surprise most English Officers to discover that as recently as 1824 it was considered necessary to "take advantage of a period of peace for re-establishing uniformity by prescribing to the Army a regulated system," because "at the uncertain discretion of Commanding Officers" various formations and modes of executing them had been introduced. But what I want especially to insist upon is this, that the drill which was introduced at the beginning of the present century by Sir David Dundas was expressly designed to secure two results which we no longer desire or require. The first object of that drill was to reduce skirmishers to their proper place; "Instead," says Sir David Dundas, of "being considered as an accessory to the battalion they have become the principal feature of our Army, and have almost put grenadiers out of fashion." The second object, and indeed it appears almost to have been the principal one, was this. With the short-ranged artillery of the day and the close quarters at which armies met, the throwing forward of skirmishers interfered with the effective use of guns. "Were our battalions also more accustomed to act in line and with cannon, they would see the impropriety of every instant scattering and throwing forward the light infantry, whose situation must often prevent the proper use of artillery." Now, in our day, the fact of our freely using skirmishers no longer interferes with "the proper use of artillery," because "the proper use of artillery" does not consist, as it did then, in placing it in positions closely aligned upon those of the infantry.

Moreover, we no longer desire to reduce the *rôle* of our skirmishers.

Furthermore, "the possibility of wheeling to a flank from column without leaving interval between the companies depended on the accuracy with which the company leaders kept the distance between companies. This careful preservation of distance was then rightly

esteemed one of the cardinal points, and the march past in column was at the time a real test of the efficiency of a battalion."

Now though that remark affords food for reflection in many other senses than that with which I am going to deal to-day, it has this bearing on my subject, that this real and genuine importance for fighting purposes of the march past tended to fix attention on one all-important parade movement—the wheel into line. It became an affair of the Adjutant, the sergeant-major, and the drill sergeant to prepare every minor movement for that great event.

The minds of all young Officers, whether at Woolwich or Sandhurst, or on the parade-grounds of their regiment, were trained to regard "column" as essentially that particular kind of "column" which is formed by the companies of a battalion when at deploying interval and ready to wheel into line. Of course "quarter column," "columns of fours" and the like were recognized, but the various positions of Officers and non-commissioned officers with a company when it was "as a company in column right in front," "as a company in column left in front," or, "as a company in line," occupied the minds of the drill instructors, and a knowledge of these constituted at least one most important part of drill.

Moreover, the fact that through many years of the present century battalions were kept as much isolated as possible confirmed this tendency. As for artillery drill, it hardly could have an existence before the Crimean War, because there were never enough guns together, still less never enough batteries together to require anything more than driving drill. Our cavalry force was small and isolated.

I do not think it is too much to say that no Committee of Officers has ever sat upon the composition of an infantry or artillery drill-book whose minds in their young days have not been formed by that condition of the mind of the sergeant-major which contemplated the wheel into line of companies formed in column as the centre of all drill, and, as in fact traditionally it was, the most important of all fighting manœuvres.

Now the point that I want to urge to-day is that as the "wheel into line" has ceased to occupy that place, we want to get rid of a certain slavery to which it bound us.

Drill in any shape or form which extends over large bodies of men is no longer the means by which we can act when in close contact with an enemy. But, whereas formerly we had only to consider each arm by itself in the manœuvres which preceded battle, the marches and movements which lead up to a modern fight are sure to involve the combined employment of all arms. Furthermore, the conditions of modern fighting are so much more varied than those of the past that it continuously happens in war that a General wants to order a certain movement to be made with a particular breadth of front—in other words with columns of a certain front. At the Battle of Gravelotte, Prince Frederick Charles, wishing to sweep round in search of the French, ordered a huge echelon of his own Army, in which each corps was to advance with a column on a broader front than had ever been attempted before in war for so extended a movement. Whether it had

ever been attempted even at peace manœuvres is extremely doubtful, for Prince Hohenlohe tells us as that when the order was received hardly any one thought it possible that it should be carried out successfully, nevertheless it was done.

So fully do the Prussians realize the importance of this facility that the Prussian drill-book expressly provides that manœuvres shall be continually attempted for which no special previous training has been given.

The tendency of the excessive severity of modern fire to induce an attempt at night marching makes it often desirable to apply to a given portion of ground formations which are suitable to it and such as admit of attack without previous changes of formation.[1] Now my point is this. It is quite possible to adopt a nomenclature so clear, so consistent, and so simple that every one can at once understand what is intended and whatever the arm concerned can adapt themselves to it. I propose no change in our general nomenclature but only that we shall rigidly adhere to a principle which already underlies our present forms.

If I speak of—

1. Battalion columns of companies,
2. Battery columns of divisions,
3. Regimental columns of squadrons,

every one understands that I mean that the whole body which is formed into a column in the first instance is a battalion, in the second a battery, in the third a cavalry regiment.

Further, they equally understand that the front of the column will consist of a company in the first instance, of an artillery division of a battery in the second, of a squadron in the third. If I add in each instance "at wheeling distance," the exact nature of the whole formation is in each instance defined.

What I want is that that form shall be universal.

If I say, "half battalion columns of companies," I want it to be clear at once that I mean that the front remains the same as in the column previously named, but that each column only consists of half a battalion.

If I say, on the other hand, "battalion column of half battalions," I want consistently with the previous nomenclature to be understood to mean that each column consists of a battalion and that the front consists of a half a battalion. The formation consisting of one half battalion in front followed by the second at a named distance.

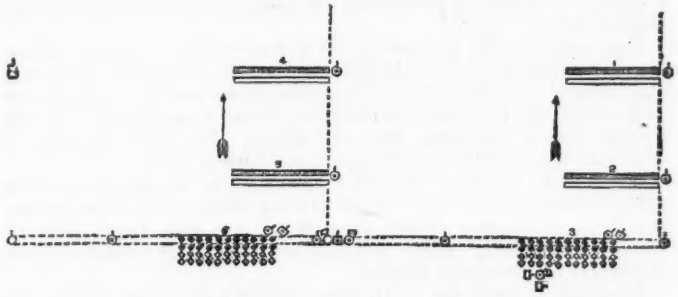
Given that the names of columns are so determined there is no difficulty in arranging them together as we do at present; thus, for instance, each brigade will be formed in line of battalion columns of half battalions at deploying interval, full distance or whatever it may be, and so on for the other arms.

[1] This was the case at Tel-el-Kebir. The incident connected with it is so fully described on pp. 76, 77 of the Official History, and in the note on p. 77, that it does not appear necessary to enlarge on it here. I am most anxious that the discussion should turn on principles, and not on the minor incidents which occurred in consequence of the then current nomenclature.

Now look at the formation I have placed on the board and see what name in all consistency it ought to bear.

Can it be anything else but a battalion in line of half battalion columns of companies?

Now according to our drill-book of 1877, that which was in vogue at the time of the Battle of Tel-el-Kebir, this formation was arbitrarily called a battalion in line advancing in "columns of half battalions."



By no manner of means can you make that nomenclature consistent with any other. It is a simple matter, but an important principle is involved in it. By giving a purely artificial designation to any formation you make the idea of drill a mere learning by rote of the prescribed forms of the drill-book. Excellence in drill depends on a mere memory of artificial formations arbitrarily laid down by a Committee.

I hope it will be understood that I am by no means anxious to find fault with the very excellent body of Officers who were engaged in that work. They only consistently carried out what has been our practice ever since Sir David Dundas composed his drill-book.

I maintain that that practice is now hopelessly at variance with the conditions of modern war.

We want drill to be as clear, as consistent, as simple as possible. We want that it shall involve no effort of memory when its principle is once understood. We want that, with the smallest possible amount of time spent in acquiring what is necessary of it, we can yet enable our army to assume any formations that the circumstances of war may require. We want the Officers of every arm of the service to understand at least the formations which are assumed by every other arm.

I believe that a consistent adoption of the principle I have suggested for the nomenclature of columns will be a very long step towards that result.

I do not know that there are any other instances which so forcibly as the one I have suggested bring out the contrast between what our principle has been and what it ought to be. As I am advocating a

principle, and am by no means anxious to discuss unnecessary details, I will not take any other instances to find fault with, but to show that the principle of consistency has not yet been so far adopted as to be evident at once to independent observers I will quote from another volunteer pamphlet by Captain Spenser Wilkinson, who lectured here last week on the "Kriegsspiel."

"The simplification of details and the clear exposition of essential principles have been" since 1870 "the two poles of all tactical progress;" "neither of these ideas has been able to penetrate into the English drill."

I am not, for the purpose of my lecture to-day, touching on any points unconnected with rigid close order drill, because I have long since ceased to believe that skirmishing is or can be a question of drill at all. As I believe it depends on effective organization, in the largest sense of that term, and on training. Its whole character is destroyed if you bind it by the rigid conditions of drill.

But for two purposes we still require drill in its proper sense on active service: one the delivery of an army within the fighting rayon; the other a purpose almost peculiar to our own Army, that of occasionally meeting certain savage tribes in a denser formation than is suitable for European warfare.

I noticed, in referring to General Dundas's drill-book, that it was devised in order to restrain the supremacy which skirmishing had acquired in our Army towards the end of the eighteenth century.

It is not a little curious that the supremacy which skirmishing had thus secured was due to the experience which our troops had acquired in fighting in America with irregulars and with Indians. Whereas now we desire to retain for our Army the possibility of being able to fight in closer formations than are necessary for other European Powers, because at times, in fighting against savages, who have the advantage of numbers, and have neither breech-loaders nor big guns, close formations still give us advantage in some of our little wars. Obviously that limitation "some" is necessary because both the American experience to which I have referred, the New Zealand Campaign, and not a few of the strictly Kafir campaigns, show the advantage which well organized skirmishing may possess at times even against savage tribes. It is also not a little curious that whereas the basis of our modern close order drill was laid by an Officer who had the most profound admiration for the rigid movements of the Prussian Army, it is the Prussians who have taught us most in modern times of the necessity of a dispersed order of battle.

For my own part I suspect that future experience will show that an army well trained to fight in skirmishing order and to adapt itself to circumstances has more frequently an advantage even against savage tribes than the nature of some of our recent experience inclines us at present to assume. But in any case, whether in those wars in which skirmishing proves to be the form of tactics for savage warfare, or for those in which close order is advantageous, I think it safe to say generally that the peculiarity of all our smaller wars, those which are the spécialité of the English Army, is this, that

they vary almost infinitely in their character. Almost every campaign of the kind has to be dealt with on its own merits. The forms of fighting which were suitable against New Zealanders are not those which are suitable against Zulus, nor are either of these forms suitable for fighting against Ashantees, nor are any of these suitable for employment against Sikukuni's Basutos. I might easily multiply my illustrations, but I have said enough to enforce the point I want to make, that even though it often happens in our small wars that we have to employ closer formations than are now suitable for European warfare, yet that we are not less than foreign Powers obliged by the conditions of our small wars to develop in our Army a great adaptability to circumstances; but that on the contrary our Army has by the very fact of its varied service a necessity for acquiring the utmost possible adaptability to circumstance. A General who has to command an English Army—until he has had before him all the conditions of the campaign on which he is to employ it—can less than any other General in Europe know precisely what he will require it to do.

Therefore I say that to lay down precisely in a drill-book every formation which an English Army is to take up binds it in a way that is more inconvenient for it than for any other Army. That principle which the Prussians from the mere necessities of European warfare have adopted, that their Army must be so trained, so intelligent, so ready to adapt itself to circumstances that it must be able to take up formations not previously practised, is more valuable for us, more important to us, than for any army in the world. It is applicable alike to Continental warfare, and to our smaller campaigns.

Furthermore, I have yet a stronger argument for the point I am about to state more fully presently. The Volunteers say, and say very justly, "It is all very well for you Regulars to practise the good old close order formations and the march past, as a means to perfecting your use of them. You may have to use them in savage warfare. But we never can be employed except against a European enemy. Our time is simply wasted in working up to a march past. We have a very short time for any training. Why not let us practise only the close order formations which are necessary to facilitate actual movement, and to devote all the rest of our time to such training on ground as we barely get time for?" You will find that point strongly insisted on both in Colonel Aspland's pamphlet and in Captain Spenser Wilkinson's.

Now, I think that experience has shown that it is not practically possible to give one form of close order formation training to the Volunteers and another to Regulars. Sir Daniel Lysons made a vigorous attempt to carry out a system of the kind. It broke down at a point that will not surprise you. The minds of our sergeant-majors were trained in one groove. If they had had to get up some altogether different drill they would no doubt as a matter of duty have learnt it. But their very zeal led them to vie with each other in attaining the highest perfection they could. Now their idea of the highest perfection was to train their Volunteers to become as

mechanically perfect as possible in working out the prescribed forms of the drill-book leading up as the summit of all perfection to the march past.

If you want to limit your Volunteers to certain drill instruction, so as to give them time for more important training on ground, a change must take place in the minds of your drill-instructors. No orders will do it. The very power and influence of military training is too great for that. It moulds a man. As it moulds him so he will be. Therefore I say that it is all-important to us that even in our close order drill the man shall be so moulded as to be adapted in mind to the modern conditions of warfare. You say—no one has insisted on it more strongly than I have done myself—that drill—close drill—rigid drill—is a most important agent in instilling discipline. But blink the matter as we may, the discipline itself that we want is not the discipline that General Dundas wanted.

We do not want less exact obedience from all ranks than he did. We have a much greater need than he had for an engrained principle of subordination and obedience throughout all ranks. But neither in our small wars, even in those which occasionally demand close order formations for fighting, nor in any fighting against Continental armies, do we want the assumption that there are certain forms, mechanical perfection in the adoption of which will ensure victory irrespective of circumstances, irrespective of the tactics of our enemies, irrespective of ground.

Now see what happens. A Committee of Officers draws up certain mechanical rules for each arm of the Service, without reference to any other. They then draw up certain forms, and give them names based on no fixed principle, and simply considering how movements in each instance can be most rapidly made so as to get troops into the required position, lay down the steps by which the formation is to be taken up—sometimes in one way, sometimes in another—equally without any avowed simple and clearly understood principle. If then these are laid down by authority as the rules which are to be followed because they are so laid down, then the effect of that is this, that the discipline you instil by your drill is a mechanical and unintelligent discipline.

I maintain on the contrary that the principle of your drill—I speak of your rigid drill—ought to be so clear, so simple, so easily intelligible that, once understood and grasped as a principle, the drill-book may be cast aside and any formations ordered may be taken up in accordance with that principle, whether they are contained in the drill-book or not. In order to do that there must be a language in which the man who commands can speak, and those who have to obey his orders can understand him. That is what I mean by a drill nomenclature, simple and consistent for all arms.

Practically "column," "echelon," "line" represent all the close order formations we have to do with.

What I want is that the line, whether of cavalry, artillery, or infantry, shall be taken as the convenient starting point. That then the designation of columns shall be such as I have indicated, the phrase

"Battalion Column of Companies" being the representative. It being understood in each instance that the word which precedes "column" defines the portion of the line which is to be formed in column, that the word which follows "of" defines the portion of the line which is to be the head of the column when formed. If that be accepted there is no possible column which a General cannot order so as to be understood provided all fractions of the army when in line have a clear and simple designation. With the infantry that is the case now. Everyone knows what companies, battalions, brigades, divisions are, and you can with certainty if you like order for an infantry division—

Division Column of Companies,
Battalions,
Half-battalions,
Brigades,

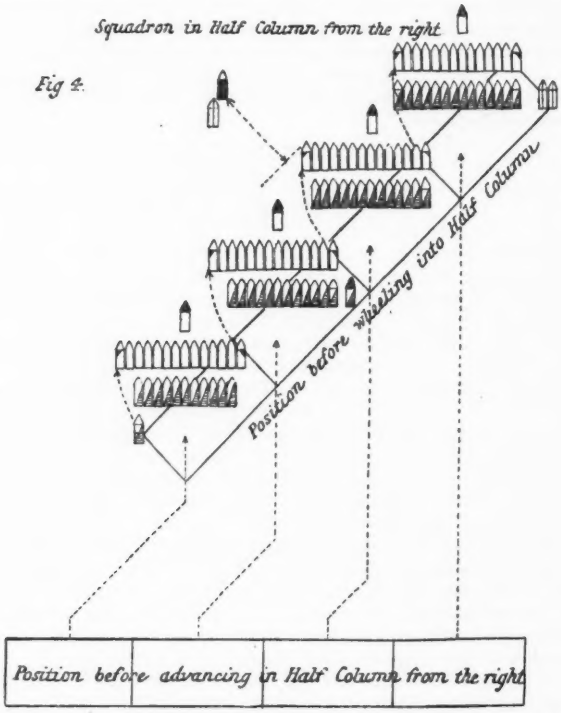
without any fear of your meaning being misunderstood. We in the Artillery have two confusing words which would somewhat interfere. We speak of divisions in our batteries and divisions of batteries. Both words somewhat clash with the great division of an army, and conceivably might lead to error on a battle-field. I don't see that as far as the designation of parts of the line any other difficulties occur. The name "Quarter Column" is of course only an abbreviation; but I must admit that I think that it contains in it an objectionable element. It smacks of the idea which contemplated that formation of the battalion on parade in column of companies ready to wheel into line as the centre of existence, round which the minds of soldiers ought to revolve, much as the world for a good Yankee moves subject to the Constitution of the United States of America.

It is obvious that I want for my purpose to keep the place before the word "Column" sacred for the word which defines the body which is to form the column. I don't attach a very great importance to the matter except in its tendency to educate the minds of non-commissioned officers and men, and the indirect effect which that education of non-commissioned officers is likely to have in confusing the volunteers. I object to anything which tends to direct the minds of soldiers towards that momentous function the wheel into line as the be-all and end-all of military life—to anything which directs their minds from the idea that the battalion is only part of a great whole whose business is to prepare for the battle-field.

Suppose I were to talk of "Brigade Column of Half-Battalions at Quarter Distance" the nature of the formation according to the assigned nomenclature would be intelligible at once. There is no reason why there should not be in it sufficient distance between each two battalions to keep them distinct, but you could not refer to it as "Quarter Column," because we restrict that to what, according to my nomenclature, is a "Battalion Column of Companies at Quarter Distance." I think that this isolation of the battalion column as something complete in itself, to be contemplated as requiring to be made up into "a mass" before we can form any army column of it, tends in

the direction of making the battalion too much the one body to which the terms of drill tend to restrict the mind of a non-commissioned officer.

I can, however, better show that any titles of the kind tend to an


Squadron in Half Column from the right
Fig 4.
Position before wheeling into Half Column
Position before advancing in Half Column from the right

inconsistency by taking an illustration from the Cavalry Drill Book. The formation I show on the board, and in the lithograph, is taken from the German Cavalry Drill Book. It is common to all armies. It is called by the cavalry "Half Column." Another illustration of a Half Column formation is shown on Plate XXVII of our own Cavalry Drill Book. It is in fact a particular kind of oblique echelon —an oblique echelon formed by a half-wheel. Its use is a matter that has been discussed in a literature. The French and Austrians object to it. At one time the Prussians had an enormous belief in it, which has I think of late been a good deal weakened. I am, however, not now concerned with its use but its name; I only care about that for the sake of contrasting it with our infantry "Half Column"

or "Quarter Column." It is the double inconsistency to any simple nomenclature of both that makes it convenient to contrast them. Half what? Quarter what? In the case of infantry it is of course Quarter Distance. The cavalry mean that theirs is an incomplete column. Clearly, therefore, the mere use of the word quarter or half before the word column does not, apart from the instruction of the drill-book, convey necessarily the meaning that by "Quarter Column" you mean a "Battalion Column of Companies at Quarter Distance." You of course may say that as a word of command "Quarter Column" is shorter to give. I don't say that there is the least objection to any abbreviation for the purposes of words of command, but I do say that it ought to be expressly explained to be an abbreviation for that purpose, and that in order to keep the minds of your non-commissioned officers clear as to the nature of formations they ought not to have any excuse for thinking that there is a certain formation containing two cabalistic words, the meaning of which has to be learnt from the drill-book. Again, I doubt very much if the idea of an extremely short sharp word of command for such a purpose is not derived from a condition of warfare that, so far as infantry is concerned, has passed away. Let me recall the fact which Colonel Aspland has well brought out, that at the time the idea of the march past and all that is connected with it was introduced, the wheel into line of companies was an actual stroke of war. It really was practising for war to be able to present with sudden accuracy that line on the flank of the moving column. No one supposes that it is so now. Our solid movements will necessarily be carried out at a distance from an enemy's attack, and it may be safely asserted that a column of companies at deploying distance will never have to close up to quarter distance with such appalling rapidity that the difference between giving an order to close up to quarter distance and to form "Quarter Column," if the latter be really shorter, will make the smallest difference in warlike effect. In fact, it is tolerably clear that the word exists because of the march past and has no other *raison d'être*. However, it is only to enforce the general principle that, especially when you have large bodies of Volunteers to take into account, it is better to use words which precisely convey your meaning on a defined principle, and had better under no circumstances use cabala that require a drill-book to interpret them, that I care to insist on the point.

I do not think it would be difficult in half an hour to convey to any intelligent body of Volunteers the nature of any conceivable column you can want to form if the nomenclature be consistent, clear, and simple. I need not discuss echelon formations because, given the names of parts to be echeloned, they are at once determined.

So far I think I may carry everyone with me because I really propose no change whatever, but a very trifling modification of names. But there is one step further which I want to suggest, though only to suggest. It seems to me as I have said that drill being avowedly now-a-days of most importance as a training in discipline, that is in the kind of co-operation and mutual support which are required in

modern war, even our rigid drill ought to tend in the direction of preparing men for the kind of mental attitude which is required in modern war.

Why should any other movements be laid down determining the exact mode in which a column should be formed, or in which line should be formed from column, other than those which are necessary to prevent bodies clashing with one another? It seems to me that this could be done by a few very simple rules that certain movements should always be carried out by fours, others by a wheel. I almost doubt if even a wheel for infantry would ever be necessary. In the artillery our corresponding movements are what we call "taking ground" and "wheeling." Of course the cavalry is in a different position, because with them their drill occupies almost exactly the same relation to war that it always did. On the whole with the exception of "Quarter Column," "Half Column," "Double Column," no two of which have the slightest relation to one another, the Cavalry Drill Book is exceptionally clear, consistent, and based on principle. All I would urge is that all the drill-books should be considered together, and that without in the least interfering with the peculiarities of any arm the nomenclature should be made as consistent as it can be.

The Americans, whose Officers are all interchangeable between the different arms, have carried this to the extreme point of calling the several parts of their different arms by the same names. I don't see the least advantage in that. It seems to me that a "battery," a "squadron" convey their meaning much better than if they were mashed into an unreal uniformity.

But there is no reason why the forms of columns should not be at once understood by their names. I think in the cavalry they are. But speaking of infantry and artillery, I do think it would be an advantage if the aim of all inspection was to test so far as knowledge of drill is concerned, not whether a young Officer has accurately got up the forms prescribed in the drill-book, but whether he understands the principle of movement so well that he can put a company, a battalion, or a battery in any position, and in any formation that may be ordered, even though such formation may not be laid down at all.

I think that any one who will look back at the history of our drill and see why the present system was introduced will see that, at the time when Sir David Dundas proposed it, uniformity was essential to actual warlike efficiency. I cannot see now that except for the most elementary parts of drill it now presents even any advantage, provided the nomenclature of forms be so clear and simple that the meaning of any order given can at once be grasped.

However, I am anxious to separate this last rather radical suggestion from my general proposition, and I think that even those who are not prepared to accept all I have suggested on that point may yet agree with me in the importance of a clear and consistent nomenclature.

General ERSKINE: By way of opening the discussion, my Lord, I beg leave to offer a few remarks on the paper to which we have just listened. I think I shall be only anticipating the verdict of all who are here present if I say that Colonel Maurice has produced a paper treating on a very important subject, and has done it in the way which we should have expected from him. There is no doubt that we cannot attempt to simplify our system of drill unless we commence by simplifying the nomenclature. Unless we have clear ideas in our minds we cannot express ourselves clearly in words; and the converse of that, I think, is true, that unless clear words are used to express the meaning of those who are addressing us, the probability is we shall not have clear ideas in our minds of their meaning. Therefore, I quite go with what Colonel Maurice has said in his paper as to the desirability of having a fixed principle running through all our system of drill, which up to the present date I am sorry to say I do not think has been the case. I was very glad to find that he has discountenanced the idea which had been advanced in some quarters, that it was possible to have one system of drill for our volunteers and another for the regular forces. I think that is out of the question. There must be one system which must be identical in the two cases. I observe in one part of the lecture that Colonel Maurice said that "skirmishing is not a question of drill at all." I think that is rather too sweeping an assertion. It is quite true that if our skirmishers are to do their work properly they must have great latitude allowed them; they must be taught to take advantage of the accidents of the ground, and the peculiar circumstances in which they may be placed when they are encountering an enemy, but, at the same time, it must be borne in mind that our skirmishers, as well as all other troops, have to act in concert with their comrades, and I do not think it is possible to do that unless they are trained on one uniform system. I should be very sorry if that system were a rigid one, but still, I think, there must be a system. The next point to which I would allude is the use of that unfortunate word "division" to represent the portion of a battery of artillery. I must confess to some little disappointment, because when I saw that the question of drill nomenclature was to be taken up by an artillery Officer, and by a man of Colonel Maurice's ability, I thought he would have solved that little difficulty about the term "Division." In my early days of soldiering, the word "Division" had a very hard time of it. We had in those days "companies of infantry" as long as they were in barracks, but when they turned out for a battalion field-day they changed their name into divisions. The battalion was numbered off when it was equalized by divisions from right to left; at that time also the half of a troop of cavalry was called a "division." People have become more sensible now-a-days, and they have called those portions of the line by their proper names, and, I think, it is a pity that some names cannot be devised for replacing a "division" of a battery. I think we might call the two guns and their ammunition wagons by some other name; I would suggest the word "section" for want of something better; it would not have the same objection as the word "Division," which applies to another portion of our forces. I do not want to extend my remarks very far, but there is one point on which I should like to say a few words, and that is with respect to marching past. When I approach that subject, I feel I confess something like a man who has taken up the cudgels for an old friend who has been pretty stoutly abused and deservedly. The objections which have been raised to marching past, I think, may be put down as three. First of all, it is said that marching past is useless. Of course that, if it were true, would settle the question at once. Then it is said that it can only be learnt with very great difficulty, and, thirdly, it is said that marching past on a field day consumes a very great deal of valuable time. With regard to the first objection, I think that marching past is not altogether useless. An inspecting Officer, when he is reviewing his troops, can judge much better of their efficiency by having them defile before him, instead of contenting himself with merely riding down the ranks, and looking at them while they are standing still. Then with regard to the difficulty of marching past, I cannot see myself where that exists. I quite allow that in former days marching past was made a great deal too much of. Commanding Officers seemed to centre all their energies in teaching their battalions or regiments to march past; but surely if troops were properly taught to march, and everybody allows this to be essential,

there ought not to be much difficulty in showing them how they are to march past their reviewing Officer; it is nothing but marching after all. And thirdly, with regard to the consumption of valuable time, I think that is a matter which depends very much upon the arrangements of the Staff Officers. The troops which have to take part in a field day must march to the ground, and they must march away from it, and surely with a little careful arrangement there need not be any great consumption of time in allowing the troops to march past the reviewing personage, whoever he may be, either in going to the ground or in marching from it. There are several other points I should like to say something about, but as, no doubt, gentlemen are waiting to address the meeting, I shall be happy to give way to them.

General SHUTE: I was a few years ago for some time on a Committee at the Horse Guards with the object of assimilating, as far as possible, the words of command in the different branches of the Service. We made a great many changes with that view; and with regard to any alteration of nomenclature, I think that this should be the very greatest of its objects. As a rule, almost all forces now-a-days, however small, are mixed; that is to say, they are composed of cavalry, infantry, and artillery, and every General or Field Officer in command should be enabled with facility to express himself simply, plainly, and clearly to any of those three branches of the Service. I have often seen giggling amongst thoughtless young Officers of cavalry when some infantryman had ordered an advance—perhaps in column of companies from the right of squadrons, a troop to "right close," or a vidette to "left face," but, worse still, important orders altogether misunderstood; and I do therefore think it is a very great object that our nomenclature should be as simple and as similar as possible in each branch. Now with regard to divisions, whenever a squadron exceeds forty-eight files that squadron should be told off in divisions as well as troops, and going into the field our squadrons ought invariably to be upwards of 100 horses. I do not myself see how you could possibly confound a "Division" of an army with a division of a squadron or battery, though in the former case you might conveniently substitute the term "half troop." But in the latter term, I do not know any terms better than division and subdivision. As regards words of command in general, I cannot quite agree with our lecturer. In the infantry, words of command may be somewhat *expressively* long, but in my particular branch of the Service (the cavalry) they ought to be short, sharp, and to the point. Cavalry being an arm of opportunity, there should never be any delay either in expression or action. As regards the marching past, I most fully concur. There is no doubt—and every man who has commanded a regiment as long as I have done knows perfectly well—that a vast amount of time is utterly wasted in complicated parade movement. I maintain that a column marching past a General Officer should march past both with regard to the position of Officers, non-commissioned officers, and men in exactly the same form that they would do on any other occasion. And as regards infantry, it is only the mounted Officers who should be called upon to salute. Believe me, in these days men have quite enough to learn without observing unnecessary ceremonial forms. I am making these remarks perfectly impromptu, and I hope you will excuse me if they are not quite to the point.

Colonel the Right Hon. J. H. A. MACDONALD, C.B., M.P. (Lord Advocate): I wish, in the first place, to thank Colonel Maurice for the very kind remarks which he has made in his lecture with regard to the volunteers. I know a good deal has been said—and perhaps necessarily so—as to what may appear to Officers of the regular forces to show a slight want of discipline on our part. I hope, however, that they will remember that we are not soldiers, and have not been taught in the school in which they have been. May I remark that I think one reason why our drill in all arms of the Service has not made the progress it ought to have done, has been to a great extent the fact that Officers of the Army feel it their duty to do just what they are told without comment. I hope it will not be believed that volunteer Officers have any lower sense of discipline than Officers of the regular Army, and that when they express themselves strongly in criticism it is from the habit of their own life, and especially it is the habit of us lawyers to say things as strongly as we can, particularly when endeavouring to impress the official mind. The nomenclature of the drill-book is, I think, defective, not only as regards the

names of formations, but is also extremely defective as regards the mode in which it describes what is to be done in passing into or out of the formations. It is of the greatest possible benefit, when it is intended that you are to move anywhere, to express the movement in direct words according to their own meaning. Instead of using the words "Advance" and "Retire," or "Front" and "Rear," which have no real bearing whatever upon what you are doing,[1] it would be a great advantage if, when you said "Right" everybody understood that he was to go to the right, and if, when you said "Left," everybody understood that he was to go to the left. I will give a simple illustration. A column is going through a gate into a field marching in fours. The Commanding Officer wishes his men to form up either into a column or into line in a left direction by successive companies. Why should not he say—"To the left, form up" either "by successive companies" or "into line," instead of front forming or rear forming. Then every man would naturally turn towards the left and come up to his place the shortest way, and the whole thing would be done intelligibly, easily, and quickly. They would come up out of fours into companies or line without the slightest difficulty; instead of that you now make the execution of your movement depend entirely on memory as to "fronts" and "rears" having no real relation to what is being done. When a man has marched 3 miles from his parade he is called on to remember whether his front, when he left parade, was this way or that way, and if ranks have been changed he is called on to remember the change.[2] It is perfectly plain that if—as it must do—the manœuvring of the future is to call upon men for the exercise of individual intelligence, it is indispensable to appeal to their intelligence and train their intelligence all through your drill, both by the names you give to your formations and also the words you use as words of command to carry them out. Now I hope it will not be supposed by anybody that volunteers object to rigid, strict drill, for the reverse is the fact. What they object to is being drilled for a long time to do things which are utterly useless in themselves, and the moment they are told to do that which is supposed to represent warfare, not only the thing they have to do is changed from what was done at ordinary drill, but also the words of command are changed. What is the result? You drill men three-quarters of an hour, and keep them as stiff as possible and move at cabalistic words of command. You never stand at ease if you can help it for fear of "shaking" them, as you say, and you do your utmost to produce an exact moving automaton; and then when you are going to begin to do something which shall have a resemblance to warfare, you abandon your whole previous work and all your "Keep your touch" and your "Left wheel into line," &c., &c., and you say something like this: "The battalion will advance for attack." The moment you utter those words the necessary idea in every man's mind is—"Now I am going to take it easy, and do what I like." In go the swords, away goes the magic word "Attention," and "looseness" is the order of the day. Now, I think it should be exactly the reverse. During your first three-quarters of an hour, if you will, drill as stiffly, as rigidly, and with as strict attention to dressing and everything else as you please. This you must do; but do it in carrying out that which you intend afterwards to carry out as an exercise. But I will go further and say, it would be infinitely better if you were to take a quarter of an hour instead of three-quarters to do some movements suitable for bringing troops into position for an advance to attack. Do these as a strict drill, calling it a drill, and making the men understand it is drill to be done with exactitude, and then afterwards do the same thing as an action exercise, telling them that they are now to do this as an exercise without detail dressing and checking of intervals, and must use their own discretion and apply the principles strictly taught to the exercise in which they and their Officers must work as if they were going into action. Then

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[1] The statement of the F.E. that a convenient mode of "advance" is by the "flank march of fours," is a good illustration of the military "derangement of epitaphs" *à la* Malaprop.—J. H. A. M.

[2] It is this which has practically reduced "Change ranks"—a most valuable improvement—to a practical dead letter, never practised except at "March past," although expressly enjoined in the F.E.—J. H. A. M.

for another quarter of an hour do "Attack" with the same strictness, and then repeat it also as an action exercise, as if in action. Then the men will intelligently understand why you taught the different formations strictly first, for the purpose of getting them to understand the formations, so as not to lose their heads during the action exercises, and they will understand that the two things are really the same, but the one is the lesson of the school to teach the elements and to teach obedience, and the other is the lesson of the training college, teaching the intelligent application of the school lessons to develop the trained man. As regards the marching past, if it is not to be an exhibition of what men are supposed to be able to do, and to be called upon to do in the field, one does not see what the object of it is at all. If it is to show the men to the Officer in command, he can see them just as well if they march past in column of fours as in close file companies; nay, I would maintain rather better. The reason why marching past was of great value in the old time was because the very thing done in marching past exhibited what you wished to exhibit to the enemy, and whereby a moral effect would be produced. You knew that if you could keep perfectly steady in close files until you came within 200 yards of him in spite of his fire, and move steadily as you would move on parade, notwithstanding his shouting and demonstration, you would produce a moral effect which would make him go before your shock reached him.[1] You cannot produce that effect now by the same means. Fire is opened upon you at distances so great that no moral effect by *appearance* can be produced. Modern conditions of fire make it impossible. You must get into a formation which will enable you to go long distances over rough ground, and stick together as well as you can, and it is for that principally you must be trained. And, therefore, why not march past with each company in an order with intervals; if you will have a march past why not march with the men of each company moving with an interval—as they must do in the field? Why not abandon altogether the march in touch which you will never do on service. Regiments moving about the Fox Hills or the Long Valley do not trouble their heads now-a-days about "touch." Every military man knows perfectly well when he takes his regiment out for three weeks to the Autumn Manœuvres that when he comes home his regiment would not be able to march past creditably under your present system. I remember Officers speaking to me with a shrug of their shoulders at the Autumn Manœuvres in 1872, and saying, "It will take us weeks in barracks to get our men into discipline after all this unsteadying work." That is because men when they are taken out into the field do not do what they have been accustomed to do in the barrack-yard, whereas, if everything in the barrack-yard had a direct relation to what they would do in the field, going out to the field for Autumn Manœuvres would not unsteady them, but would confirm them in the habits which they had acquired while teaching them more of the intelligent exercise of those habits. I do hope to live to see the day when this work of revising our drill-book will be begun at the beginning instead of as it begins now—practically at where you left off. You take what you have got and try to patch it up, putting the new into the old and making the rent worse, by which drill and practical exercise are torn asunder. What you have got is utterly unsuitable to be worked in with the new which modern conditions of war make imperative. The first thing to be done is to consider what has a soldier got to do, as a soldier and not as a performer in a show representing Peninsular battles; and then, having decided what a soldier has got to do when he is really acting as a soldier under modern conditions, you must adapt your system to that requirement. Then teach that system throughout both as a "*drill*" *lesson* and as an "*action*" *exercise*, teaching the soldier detail by the one, and intelligent application of the detail by the other, and training and disciplining him by both.

Major-General E. H. CLIVE: It was not my intention to have said anything at this discussion, but I am anxious to ask one question of Colonel Maurice which I do not quite understand. The lecture is headed "The Advantages of a Simple

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[1] Speaking of this close-file steadiness of British troops, Marshal Bugeaud called it "that moral effect of steadiness which nothing shakes, *even if it be only in appearance.*"

Drill Nomenclature consistent for all Arms, apropos to an Incident at the Battle of Tel-el-Kebir." The first, and the greater part of it, advocates simplicity in words of command applicable to all arms. In that, I think, probably everybody will agree. At the end of the lecture Colonel Maurice advocates more elasticity of drill, and that the conditions of drill should be suited to the requirements of war only. But as the lecture is based on an incident in the battle of Tel-el-Kebir, which, as I understand, was the tactical order for the attacks on the entrenchments and was not carried out by the troops, it seems to me that if Colonel Maurice means, that he wishes the nomenclature made simple, in order that a General Officer may be able to prescribe on the previous evening the exact tactical formation in which he wishes to come into action the following morning. I have some doubts whether this is a result that we should strive for, and moreover it is not quite in harmony with the latter part of the lecture in which Colonel Maurice recommends elasticity in drill, and that the responsibility for tactical formations shall depend upon the individual commander at the time. The ground may vary, the light may vary, unexpected obstacles may arise from the movements of the enemy, and it might be most dangerous if it were understood that any General Officer, no matter how talented he might be, would be acting prudently in ordering the day before how he would take up a given position. It is because I cordially agree with the last part of the lecture, and that I wish to see drill made more elastic, and everything to depend more upon the command of Officers of small units, that I prefer to consider the Tel-el-Kebir incident to be more or less an exception. I believe I am accurate when I say that Lord Wolseley was able not only to prescribe the order of attack the night before Tel-el-Kebir, but even to define before he left England the point at which he intended to fight the decisive battle, and the day on which he intended to fight it; and, conceding to the full the confidence and pluck in making the prophecy, and the administrative ability by means of which it was fulfilled, I consider that the fulfilment was due to an altogether exceptional combination of circumstances, which has probably never occurred before, and is never likely to be repeated in any campaign; and our Chairman's striking success on that occasion does not convince me that the detailing of an order of attack by the General Officer commanding the army will be so uniformly attended with success as to make the practice desirable. Leaving this objection, which will, I hope, not be considered hypercritical, the simplication of words of command is greatly to be desired; and we have to thank the Adjutant-General's Department for having already done much in this direction. Thus the word in the old drill-books, "The battalion will change front to rear by the countermarch of subdivisions round the centre: right subdivisions right-about turn: the whole, right wheel," has been altered to the word "Change ranks." Many other changes in the same direction will suggest themselves to Officers present. Again, some movements whose origin is nearly lost in antiquity remain till now. Thus, on trooping parades, when forming duties, the Officers commanding guards are placed opposite their guards, and after recovering their swords, march 50 yards or more on the second file from the right of the respective guards. When first introduced, it is believed that this march on a given point was thought a good test to ascertain whether the Officer was fit for duty. For such a test it is now happily no longer required, but the exercise remains in the drill-books, and makes a very pretty movement, as may be seen on any fine morning on the Horse Guards Parade after the 1st May. I can only say that if after this discussion steps shall be taken for reducing the drill-book to the smallest size, and for retaining in it only those things that are necessary for purposes of service, I believe that there will be plenty of material left to supply a satisfactory test of the discipline of troops both morally and physically.

Colonel TROTTER, Grenadier Guards: I will not detain you more than a minute, but I should like to make one or two remarks on a subject that the Lord Advocate has mentioned. I am delighted to hear that the nomenclature of the three arms is to be assimilated, but, at the same time, I do think a little rigid drill is not a bad check. I find it is very difficult to get men to drill very steadily, and when they do drill steadily, I find it is very easy to get them to work in open order drill. I do not think a man who can do the open order drill well can, for a certainty, therefore do the steady drill well. There is just one other remark I should like to

make, that is, I read, I think, only yesterday, in Captain Mayne's most excellent book on Fire Tactics, that troops who are able to control their fire must be the best drilled and most efficient troops, and, I believe, that those troops who have been well taught in rigid drill will be the ones who are able to control their fire best in war.

Lieutenant-General G. W. A. HIGGINSON, C.B.: I had no intention of taking up the time of the meeting, but for a remark which was let fall by Colonel Maurice, and which found an echo in the speech of the Lord Advocate, on the subject of elasticity in drill, and as one word of personal experience may possibly be worth pages of written testimony, I venture to invite the attention of those present to what fell under my observation at the Battle of the Alma. I had the honour of the personal friendship of the late Lord Clyde, who was extremely kind to me as a young Officer, and with whom I was frequently in communication at the time of our first landing in the Crimea. Riding with him on the day previous to the Battle of the Alma, he described to me the great advantage in a highly drilled regiment, such as he had commanded (the 98th, if I recollect rightly) in India, at the battle of Chillianwallah, that he had been able to profit by a system of drill which he had established in the barrack-yard, and the carrying out of which under fire entirely depended upon the intelligence of the men developed by the steadiness acquired in that barrack-yard. He had formulated it according to the rule of the school in which he had been brought up, the school which has been referred to as that of pedants, and, therefore, possibly the word of command used might appear too lengthy to our ears, but it was equivalent to telling the men that they were to open out and fire as they advanced. He remarked that the power and effect of this advance firing, even in those old ramrod days, was of the most telling effect, and contributed very greatly to the victory on that occasion. On the following day it fell to my lot to be in action in the right battalion of the brigade of Guards at the Battle of the Alma. Under our Commanding Officer's (Colonel Grosvenor Hood), strict injunction, and he was one of the finest soldiers I ever knew, and to our great loss was subsequently killed in the trenches, we were forbidden to advance till our formation was as rigid as if we had been in Hyde Park. This was after crossing the Alma, and under the ridge which dominates the southern shore. There we found many of the Light Division who were only waiting a fresh opportunity to advance, and who closed up in our ranks. We advanced, and no sooner had we reached the summit of the ridge, than we fell under a withering fire, and without any word of command, but simply by exercising an intelligence to which their long practice in barrack-yard drill had added confidence, the men separated themselves, ceased their shoulder-to-shoulder formation in the literal sense, but never losing an intelligent line, by which I mean their line was never broken so as to become in any way dangerous, then fired, and advanced exactly in the way that Lord Clyde had on the day previously described to me. But the conviction fell upon my mind then which subsequent events have entirely confirmed, that notwithstanding the greater intelligence of the men who are now in our ranks, and notwithstanding the advance made amongst Officers of all ranks in their knowledge of their profession, unless you have a steady barrack-yard instruction, which I call the grammar of a soldier's education, you cannot develop that elasticity which modern armies so imperatively require.

The Right Hon. J. H. A. MACDONALD: May I be allowed a word of explanation, because I am afraid the volunteer is very often misunderstood in this room? There is nobody more strong than the volunteer for rigid and strict drill for the purposes of discipline and training: what we object to is its being applied in an obsolete form, divorcing the discipline training from the practical exercise. The last speaker will realize that if now it be true that men cannot advance close to the enemy and come "under a withering fire" in close formation, and then spread out, they ought to be trained, as their normal formation, to be spread out from the first.

Major-General J. H. DUNNE: As one who in the same year as your Lordship entered the Army, and for thirty-six years have been knocked about and drilled in every possible form, I must remark, with regard to Colonel Maurice's views, that when he says he would leave a free hand, more or less, to the Officers to initiate various movements of drill, I think that would be rather dangerous, especially with

young Officers. Whatever drill is brought forward for the future, I agree that the shorter the words of command are, the better. Instead of such a command as "Right form four deep, march," as it was in our ancient drill-books, "Fours right" is infinitely preferable, and so are almost all Colonel Maurice's suggestions, but if they are carried out, as I hope some of them may be, at all events they must be definitely laid down. Even if the Red Book, for which I am afraid after to-day we shall almost lose all reverence, if this poor unfortunate Red Book which we were taught to venerate from our youth upward, if that is entirely to be destroyed, you must give us a short Red Book that is definite. It is impossible to train men without having something definite and clear for men to go on. Better a bad drill-book than none at all. The last much abused drill of attack, wonderful to say, has existed nearly six years, and is at all events infinitely preferable to allowing every Commanding Officer to carry out the movements as he fancied. Infantry must be *drilled* as to elasticity just as much as to steadiness. It is *very* difficult to drill men to become elastic, and to go through the whole drill of attack requires far more intelligence from an Officer to drill those men in the way you would have to work in actual war than ever it did to teach them to march past. I am sure the Lord Advocate will agree that you cannot drill them too much in practically elastic and open order movements. They must have something to go on, and it will not do unless you have that something definite, in lieu of the system which has been almost entirely destroyed to-day. I am quite sure that anything is better than perpetually chopping and changing, or leaving Commanding Officers and Brigadiers free to exercise their own particular fads. No regiment will ever do well if its drill is chopped and changed whenever it is moved about, commanded one day by a man who wants one thing and by another another, one Brigadier having one plan and another Brigadier another.

General Sir C. P. Beauchamp Walker, K.C.B.: My Lord, I am, perhaps, in a position different to that of every other person in this room, for of my twenty-five years' regimental service I served half in the infantry (and had a great deal of good instruction knocked into me by my old friend George Erskine), and the remainder in the cavalry. As you may suppose from the experience I have had in studying the movements of other armies as well as our own I have thought a good deal over the question which has been started, and which I hope will be carried out whether by Colonel Maurice or by others, namely, that of assimilating the nomenclature of the different arms. I have long wished to go very much further than that point, but having served so long a time in the infantry, and afterwards with great interest for an equal time in the cavalry, I have long thought over and wished for some mode of assimilating the words of command in both. There is of course one very great difficulty in assimilating the drill, which is, that with the advance of years since I entered the Service, the infantry drill and practice has become essentially loose, and the cavalry drill remains very much as it was when when I entered the Service more than fifty years ago. I therefore hardly see how one can in any direction assimilate the two drills, but I was very much struck when leaving the infantry and joining the cavalry in finding how very much simpler cavalry drill was than infantry drill, and from the experience which I gained from serving with that great army, the German Army, in two campaigns, and for twelve years on the drill ground, I was very much struck with the extreme simplicity of their cavalry drill, a drill which, unfortunately, we find totally impossible to introduce into our Service because our squadrons are about the size of their fourth part of a squadron. It was therefore impossible to introduce what I consider to be the only drill suitable to cavalry, that is, a squadron drill to which the greatest possible attention should be paid, that squadron being divided into as many parts as there are squadrons in the regiment. A great many years ago my then Colonel of cavalry, who was a most able drill and a most diligent student of military subjects, practised at Cahir drill similar to that in use in the Prussian Army, the non-pivot drill, in which the squadrons, working in rank entire, were in fact formed into as many divisions as there were squadrons as headquarters. That brings me to a point which I have long had on my mind, and which I shall be very glad to see settled, and that is the mere definition of what the word "division" means. I have had in speaking and in writing to use that word Division very often, because the fourth

part of a squadron, according to my idea, is a Division, so is half an Army Corps, so is a third part of a battery of artillery, and so in my early days was a company of infantry, and the only way in which I could make myself clear, was by always writing of the Division of an Army Corps with a big D, and the others with a little d. I hope that a good deal of that which has been said this evening will tend, notwithstanding what my friend General Erskine has said, to do away to a great extent with that very tiresome performance which is called marching past. It seems to me to be a horrible waste of time at the commencement of a day's manœuvring, tires out your men and horses, and particularly the men, before they really begin to drill. Perhaps the greatest advantage which I had in my life was that of serving intimately for eighteen months under the most practical General Officer I ever had to deal with, and that was Lord Seaton. Lord Seaton never "marched past" except on extraordinary occasions, which only occurred once or twice in the year, but at the end of every field day he used to post himself in a commanding position, and to say to his Adjutant-General, "Let the troops march past me on the way home," which was all that he wanted to see, and what is more, he saw how they looked after they had done their work, and not before they began to work.

General ERSKINE: That is just what I intended.

Sir BEAUCHAMP WALKER: I am glad we agree: I have always looked upon it as the best time. In the German Army marching past only takes place on great parades, and on many occasions I have had the honour of attending His Majesty, and all that he did was exactly what Lord Seaton did. He said: "Now let the troops march past me on the way home and I will look at them; or let so many as are near and let the others go away to their posts." I am very glad to find myself in perfect accord with General Erskine, because, even on so small a question as the value of "marching past," I should be very sorry to differ with one from whom I learnt a great deal that was valuable at the commencement of my service.

Colonel BOWDLER BELL: With regard to the simplification of drill, I may say that in the United States they have hitherto tried to assimilate the drill of the three arms as far as possible, in fact their drill-books are all on the lines of making every arm drill very much in the same way. On this accounnt they used to call troops of cavalry companies, but lately a reaction seems to have taken place. A Committee commenced to sit on the 10th of this month at the War Department in the United States to reorganize the whole of the drill of the American Army, but from what I can gather they are not likely to assimilate the nomenclature quite as much as some of us might have hoped. The Americans, however, are a very ingenious and practical people, and no doubt if the Committee ever does come to a decision, and if its conclusions are adopted, which is not always the case in America, the drill may be a very model one, and it will at any rate be a very useful one for us to study.

Colonel MAURICE: I really have little to say in answer to the very kind discussion which has taken place about my lecture, as there has been so little with which I do not most cordially agree. I only have to point my agreements rather than my difference in the few instances on which I have to say anything. First of all, General Erskine spoke about my remark as to skirmishing not being a matter of rigid drill. I quite and most cordially agree that skirmishers must learn to act in concert with their comrades: they must be trained to this. All I maintain is, that the very purpose of skirmishing is to take advantage of ground, of the tactics of your enemy, and of a variety of incidents which occur in battle; and in order to prepare your men for that, the thing you want is as much practice on ground as you can get. That seems to me something so entirely apart from rigid drill on a perfectly smooth parade-ground, that I merely meant to relieve myself from the responsibility of dealing with skirmishing to-day, because I found that for the purpose of my particular lecture, there was so much else that would have to be gone into if I touched skirmishing, that I wanted simply to deal with the question of nomenclature for those fixed formations which we must still have for the purposes of movement. It seems to me that, looking to skirmishing as an ultimate result for which we have to prepare, that I know nothing, however much we have learnt from German Officers, which in any way touches the perfection of the instruction to be got from an old book based on experience in the Peninsula, and

although the conditions have to be modified because of the question of firearms and so on, still in all essential points the training of our Light Division infantry in the Peninsula was most complete, and really the ideas as preached by Colonel Gawler and as preached by the Prussians to-day are so extraordinarily identical, that I cannot help thinking that with a very much longer war experience the practice may have been worked better in the Peninsula than it has been worked out by the Germans since, as I think they themselves frankly admit, for at the end of the Peninsular War it must be acknowledged that we turned out the finest fighting body for light work that has ever existed. The changes required to suit our modern firearms are very small. The extent and length of their war training made up for the difference in their experience, because it is chiefly a question of human nature rather than of actual weapons. Now Gawler's system of training can certainly not be called drill. That is all I meant: it was merely to exempt myself from responsibility in relation to it that I touched upon skirmishing at all. Next General Erskine complained that I had not tackled the question of "a division" of artillery, being an artillery Officer. If I may venture to say so, it was because I am an artillery Officer that I did not venture to touch on such sacred ground. I did not want to go down and be "pitched into" at Woolwich for venturing to suggest some change of name for a division of artillery, although I think it very important that some change should be made; still I think, as in a thousand other cases where changes have to be made in matters with which men have become exceedingly familiar, it is most important to consider the regimental prejudices and feelings of men, and not to be in too great a hurry to adopt a sudden change of name. Therefore I do not want to commit myself to a specific name. All I have done in the case of other nomenclature is to ask for a strict adherence to what we have already adopted. I ask for no general change. I want to change anything that tends to confusion, but I am not in a great hurry to give some particular name to take its place, because that is a matter in which everybody's prejudices, temper, and views have to be taken into account largely. General Erskine says that marching past is not altogether useless. What I have said is, that it is no longer what it was—the one thing that is sacred, the one thing to which all attention ought to be directed. And what I contend further is, that if we are going to have the marching past, it is much best to have it as General Erskine expressly said himself in the way of simply seeing men pass after their work, and not making it the thing in preparing for which all work is done. On that point there is a most admirable remark in one of the papers called "Citizen Soldiers," by Captain Spenser Wilkinson, in which the point he makes is, that the essence of our old rigid drill and the perfection of our old rigid drill was almost identical with the sort of "form" that a man gets in a boat at the University, that is to say, a young undergraduate joins a University crew, able to pull pretty strongly somehow or other in a boat, but he gets shrieked at from the banks, and he gradually gets to sit with his back and arms in the right position; he gets to pull in a certain "form," and by the end of his first, second, or third term, he cannot pull in any other "form," and he has been turned into a particular machine working in that particular form, which is the most perfect of its kind. That is the thing we did get in the absolute perfection of our old rigid drill movements, because it was our actual weapon of war, and the thing with which we struck our war-blow was the perfection with which we had got into our "form." But if you are going to get anything like that, as it was illustrated by the best marching past, it will take you an uncommonly long time, and will sacrifice time which we want now for quite a different "form." The thing towards which we want to work is the "form" which will give us the most perfect effect in war, and our rigid drill must lead up to what will prepare the minds of the men for that. General Shute I think hardly followed one part of my lecture, because I had most expressly excepted the cavalry from what I was saying, maintaining distinctly what he says and what I am sure is true, that you cannot deal with cavalry as you can with either of the other arms, because drill does retain for cavalry precisely the position it has always had. Short sharp words of command which effect rapid movements must remain for cavalry the effective mode of action, and therefore I am most happy to find myself in ample agreement with everything that General Shute said.

I really was not responsible for trying to take away from the cavalry what is necessary for them, but I cannot bring myself to believe that it would not be possible to give such a thing as this (pointing to the diagram of the "half-column") a different name. It occurred to me when Sir Beauchamp Walker was speaking, that I ought to have replied that the half-column diagram does not represent four squadrons, but it is simply four divisions of a German squadron. That is what they call a "squadron half-column." I cannot see myself that it would not be possible to adopt some such word of command as "Oblique Echelon Half," or something of that kind. I was hoping when Colonel Bell got up we should have got him to talk about that particular formation, because I know he knows a great deal more about it than ninety-nine English Officers out of one hundred, and he has had a great deal to do with its relation to our own Army. At any rate I cannot bring myself to understand why it should not be possible to create a short sharp word of command that shall be consistent with the rest of the commands of the Army. As to what the Lord Advocate said about my reference to discipline, I can only say that the few words I used about that question of discipline were merely to express my sense of a most valuable independence of opinion which we get from the volunteers. It cannot do us any harm. I only thought I might as well suggest that it was most valuable as a matter of literature, and might be more valuable if it complied with some other conditions which may become paramount if a time should arise when we all, whether "volunteers" or "regulars," have to consider ourselves soldiers engaged in war. I think what he said was most valuable about the question of alteration of drill, as well as the alteration of nomenclature, but I thought it was quite sufficient to deal with one principle at a time, so as to get that ground cleared first. There is one thing which he said about Officers coming back from manœuvres and finding it impossible to get their regiments to drill again. I daresay all of you know the famous story of the Emperor of Germany coming back from the conquest of France, and seeing again his Guards drilling at Potsdam, thanking God, "We have got rid of that loose stuff we have had lately in France."

Sir BEAUCHAMP WALKER: The very day after the armistice was agreed on at Versailles, I took the civil representative of England, Mr. Odo Russell, a drive towards St. Cloud, and on our way I pointed out to him a company of Prussian infantry at ordinary barrack-yard drill. He said, "Thank you, my General, that tells me more than if you talked to me for half-an-hour." Positively the day after the armistice was signed there they were hard at it again.

Colonel MAURICE: There is yet another story tending towards the same point which will I think interest you. The Prussian Military Attaché at Cairo had full opportunities for looking through everything we had been doing, and to look over all the orders of the campaign. He was very civil and kind about a great many different things, but he did not seem particularly excited or interested in anything till one day he was turning over the pages of the order book, and I saw him start. He said, "Oh, that is good, I must report that, the Emperor will be delighted to see that." It was an order from Lord Wolseley that the troops should pipe-clay their belts and resume strict pipe-clay discipline in Cairo. I tell these stories without attempting at this late hour to draw their legitimate inferences from them. Only I hope I shall not be supposed to be anxious simply to do away with all forms of discipline or order, which I look upon as more important than anything else for fighting purposes. I maintain only that the question of discipline is so vital that you must in all you do consider what kind of discipline you want now and how you can best get it. General Clive a little complained of there being an inconsistency between the end of my lecture and what I had said at the beginning, but I want clearly to point out the thing I have been urging is, that there should be a clear and consistent nomenclature, that you should have the formations that you want to get so clearly known that everybody understands when he gets an order what it is you want, and all that I ventured to say in the latter part of my lecture is that if you clearly understand what the formations are you want to get, it really does not, for fighting purposes, matter a brass farthing how you get into them so long as one body does not interfere with another during the movement. It does not matter when you want to form line from column how it is done, so long as line is formed

from column somehow or other without delay. One way is as good as another way, provided you can get all the fighting efficiency you want out of it, and if you can get your discipline out of it you had better get it without interfering with what you want for fighting purposes. Colonel Trotter touched upon a somewhat similar point in which he urges that steady drill is of great importance. I most cordially agree. I believe greatly in the importance of steady drill provided it trains your men's minds in the direction in which you want them trained: but if it trains them to mechanism and not to intelligence, I do not think it would serve you, but would do the greatest possible mischief. The same thing I think exactly covers what General Higginson says; provided that what you do in the way of rigid drill tends to promote intelligence. Surely nothing but good can come of it, but you should, in all that you are doing in your barrack-yard drill, consider the mind and character of the man that you want for modern fighting, and not for the fighting of 100 years ago. General Dunne wants some definite settlement. My anxiety is to make our settlement so definite, the meaning so clear and specific, that there may be no misunderstanding and no misconception as to what is wanted. On the other hand, as long as you are simply trusting to memory, as long as you have a formation like that (pointing to the diagram called in the 1877 Drill Book "column of half-battalions") given a name which does not commend itself to anybody—I have tried infantry Officer after infantry Officer who had not the slighest conception what that formation was, as it was in the 1877 Drill Book. It is a mere matter of memory, nobody remembers what it was, and nothing will fix it in the memory, because it is inconsistent, there is no reason on earth why that name should have been given to that formation, it is not consistent with any other formation, and as long as it becomes a mere effort of memory from the drill book about that particular formation, I maintain it is a positive mischief. I am very much obliged to Sir Beauchamp Walker for the very kind support he has given me. Whilst he was speaking I find I have been making a rather convenient equation. A Division equals half an Army Corps, equals one-third of a battery, equals three batteries, equals one-fourth of a squadron. I think that is about the condition of things as to our nomenclature at present. Apropos of the question of the degree of intelligence which we can get in our own men, and the extent to which we can make our non-commissioned officers and men adapt themselves to intelligent training, there is a little incident which happened to me just before I was coming here, that I should like to bring before you. It is a letter written from a man who has just left me at the Staff College and is now in India. He says: "My dear Colonel, I take the liberty of sending you a copy of our regimental paper;" I may say that this regimental paper is of the greatest possible service. It is established by the battalion in India, which thereby keeps up the connection with the battalion at home, with all the Officers who have left the regiment, and as far as possible with the non-commissioned officers and men who have gone home or to the Colonies. It gives especial accounts of shooting expeditions and so on, the particular point you will see directly. He goes on: "I send you the paper not with a view to your finding any interest in it, but hoping you will send us some of the numerous essays you have passing through your hands. I find the men take the greatest interest in military history, and the feeble sketch of Spicheren in this number" [It is not at all a feeble sketch but a lively and interesting one.] "*has almost doubled the circulation of the paper amongst the men.*" That is a phenomenon interesting in itself, and I think it is closely connected with the question of the training of your troops for war. When I am told that you cannot get our men to take the same intelligent interest in their business that the Germans do, I feel disposed to answer "Have you tried them?"

Lord WOLSELEY: I think, Gentlemen, the meeting is to be congratulated very much upon the general results of the discussion which has taken place. I am afraid that a great number of those who spoke in this theatre 10, 15, or 20 years ago would have been very much horrified if they could have been here this evening and heard the ruthless criticisms that have been passed upon a condition of drill and tactics to which most of us in those days were very strong adherents. From the general expression of opinion here this evening, there is evidently abroad in the Army at this present moment, and when I say "the Army," I mean not only regulars, but militia and volunteers, a decided and almost unanimous opinion that our present

system of drill as it is taught to us, and as it is laid down in our field exercise books, requires very considerable and serious modifications. Gentlemen, I am very glad to be able to inform you that His Royal Highness the Commander-in-Chief has lately had this subject very seriously before him. He has recently published a number of very interesting and, as I believe, most useful chapters upon various subjects of practical utility connected with the soldier's training. Within the last few days he has himself compared the old system of marching past with the new ideas on the subject that have been urged upon the military authorities for some time, and he has decided to eliminate from the present drill book a considerable number of manœuvres which are, in my opinion, and I am sure in his too, as unsuited for the instruction of soldiers as it would be to teach them the use of the cross-bow. I am sure it will interest all who have been drilled in these curious old manœuvres to know that His Royal Highness, among other reforms, has abolished what is commonly known in the Army as the "lock-up," and we shall have no more of that ridiculous, but time-honoured manœuvre, of men trying to stand upon one another's heels as they marched past. Gentlemen, I should like to have said a good deal to you upon this subject, as it is one that I feel strongly about and have studied as much as most of you; but I feel that anything I had to say, anything that has passed through my mind recently, or that I have written on the drill subject, has been so much better said this evening by the Lord Advocate that it would be absurd for me to attempt to go over the same ground. I fully and entirely endorse everything he has said. Up to the present time we have approached the drill subject in the wrong way. We started from curious, preconceived ideas of war, and from them we evolved a system of drill which was not calculated to teach the British soldier what he had to do when he finds himself in the field under the conditions in which war is now waged. There is no person in the world who is more anxious that a soldier should have plenty of drill than I am. I know it is very frequently a taunt on the part of those fond of the system to turn round upon men who have modern ideas, and say, "Ah, you wish to do away with drill, but we believe drill is the most necessary part of a man's education; without drill you cannot have discipline, and as discipline is the basis of all military institutions, you ought to go on drilling and drilling as much as you can." Well, I fully endorse that view. I believe a soldier cannot have too much drill; but it is not the quantity of drill I find fault with, but the nature of the drill. I believe myself that it is quite as easy to discipline a man's mind and body by teaching him the manœuvres and evolutions he will have to perform in front of an enemy, as it is by teaching him to march past in that rigid and very absurd manner in which all soldiers are taught even at the present moment. There has been a great deal said this evening about marching past, and it has been very justly remarked that a General Officer can fully judge of the efficiency of troops who march past him in the ordinary column of route as they return after a field day to quarters, as he can when seeing them march past seriously with noses up in the air and their feet thrown forward in an unnatural and distorted fashion. The efficiency of regiments must in future be tested on the rifle ranges and in the way they carry out attacks upon positions, perform outpost duty, and show themselves well instructed by their Officers in the various duties that will devolve upon them during war. The simpler the drill is, as Colonel Maurice told us, the easier it will be to teach it to the soldier, and, consequently, the more time there will be to devote to his instruction in all the serious and important operations that it is now essential he should know and understand. He has now much more to learn than he had 25 years ago, and it is difficult to find in our days of short service enough time to teach it. As I have said already, the few remarks I noted down in the course of the lecture have been so much better enunciated by my friend the Lord Advocate, that it is unnecessary for me to repeat them. If I may venture to say so in his presence, about the force to which he belongs, I would add that I believe that a great deal of the good that has been effected in our system of drill in the last 10 or 15 years arises from the fact that a large proportion of the population of England have been organized, dressed, and drilled as soldiers, and taught to be soldiers. They have brought to bear upon the various duties which soldiers have to perform, the fresh, bright, business-like ideas of men who have not been brought up in the peculiar and stereotyped views peculiar to the Officers of the regular Army. The

Volunteer force came suddenly into existence, and all its Officers came as one great body, I may say, into the Army at once; they were not like the Ensigns who join a line regiment with men of various ranks and ages above them, from Captains up to Colonels, all with formed ideas drawn exclusively from those above them. They came as a body into the Army, and brought with them those fresh ideas and business-like thoughts, and it is to that fact, I believe, that we owe a very large proportion of the success which has attended those who have endeavoured for a long time past to introduce modifications and changes into our system of drill. Nothing remains for me but to thank all those who have taken part in a discussion from which I am sure we have all derived great benefit. I would especially thank the lecturer for the very able and most instructive and interesting lecture that he has been good enough to deliver to us.

Friday, February 3, 1888.

ADMIRAL SIR EDWARD G. FANSHAWE, G.C.B., Vice-President, in the Chair.

SPEED AS A FACTOR IN NAVAL WARFARE.

By Rear-Admiral the HON. E. R. FREMANTLE, C.B., C.M.G.

How much of modern advance and improvement is summed up in the attainment of greater speed? We have only to think of the printing press, the railway, and the electric telegraph, to see the revolutions in civil life which have been due to its agency.

In warfare the same progress, due to the same agency, has been apparent. The arts of peace, better roads, better machinery, the railroad, the telegraph, have all aided the arts of war, and we feel instinctively that modern wars must be short, sharp, and decisive, in accordance with the precision of the weapons ready to our hands.

The unerring teaching of history has shown us that this is the case. Robertson tells us that "eight centuries of almost uninterrupted war elapsed, and 3,700 battles were fought before the last of the Moorish Kingdoms in Spain submitted to the Christian arms." The battle of Tours is said to have lasted seven days, and less than three centuries ago we had the Thirty Years' War in Germany.

Napoleon was the first to realize the advantage of rapid movements, which had been rendered possible by modern improvements; and in the seven weeks' war of 1866, and the Franco-German War, the railway and the telegraph were freely used by the Germans to carry out concentrations and combinations which would have been formerly impracticable.

In naval warfare the same tendency was apparent. Anson, in his famous and successful voyage round the world, after lying months preparing at Spithead, did not arrive at Juan Fernandez till June, 1741, nearly nine months after he had left England in the "Centurion," and he had separated from the remainder of his squadron. The Spanish squadron under Pizarro, which had sailed to oppose him, fared even worse, the flagship rolling her masts out of her, through "some misconduct of the Officer of the watch," as is gravely stated by Mr. Walter, in his account of Anson's voyage, published in 1748. We see great improvements from such a state of things as the

eighteenth century advanced and in the beginning of the present century.

Blockades which had developed in the middle of the eighteenth century under Hawke and Boscawen, became matters of routine under Nelson, Collingwood, and Pellew.

Still, the advance in speed and system which copper bottoms, better built and better found ships, had rendered possible, was slow; and the military combinations so successfully devised by Napoleon on land were halting and inaccurate when the theatre of war was transferred to the ocean.

The reason is obvious, the motive power was uncertain, and the most careful forecasts were apt to be falsified by foul winds or bad weather. I have alluded to blockades as matters of routine, but no one recognized more clearly than Nelson that a really effective blockade was in fact impossible, for with a foul wind the blockading squadron found it difficult to approach the blockaded port, while with a fair wind the dangers of a lee-shore compelled the blockaders to give it a wide berth, so that the idea was rather one of observation than of a strict blockade as we understand the word.

Speed of sailing was important, as the safety of a ship might depend upon her sailing qualities on special occasions, but it was not always evident or appreciated in naval operations, when a few hours of fair wind, even with dull sailers, was more than the equivalent of days of beating to windward. Strategically then, good sailing powers had only a limited virtue, while tactically the advantage was rather one of manœuvring than of sailing, as once in action a spar or mast shot away soon reduced ships to equality, or reversed the conditions under which the action had commenced.

From these facts some erroneous conclusions have, as I think, been commonly drawn, which I propose to deal with, but there is one popular error, the most common and dangerous of all, directly bearing on the appreciation, or rather the depreciation, of speed in public opinion, which may be shortly stated as follows.

It is assumed that battle-ships of opposing fleets have no other object than to fight each other, and it is argued that while both meet with the intention of fighting, and not of running away, speed must be of little moment, as it is further gratuitously assumed that they would steam at slow speed, and so fight it out.

Now a reference to previous naval history shows, as anyone who has given any thought to the subject is aware, that it was seldom equally the object of the two opposing fleets to fight, of which numerous instances might be given. The actions between Sir Edward Hughes and Suffren in the East Indies, in 1781 and 1782, showed, now the English, now the French Fleet, desirous of forcing or avoiding an action, according as troops were to be disembarked, or a blockade of a fortress besieged on the land side was to be raised or maintained; but I have no space to dwell long on this. Two more illustrations of the causes to which our naval actions had been due must suffice, as they refer to two of our greater naval victories, though of course I admit that, with Nelson at least, it was an axiom that a

French fleet caught at sea was to be fought under almost any circumstances.

When Lord Howe's fleet sailed from St. Helen's, on the 2nd of May, 1794, its object, according to James, was "to see the East and West India and Newfoundland convoys clear of the Channel, and to intercept a French convoy of 350 sail, . . . exclusive of fighting the French fleet." The latter fleet put to sea to protect the above convoy, and the "glorious 1st of June" was the battle which resulted. Trafalgar certainly resulted from Napoleon's disappointment at the failure of his plans of concentration in the Channel, through what he considered the "pusillanimity" of Villeneuve. The latter was ordered to put to sea, and had he shown any hesitation in doing so, he was to have been superseded by Admiral Rosily. Even so, however, he was not ordered to leave Cadiz *to fight the British fleet*, but to take some troops to the Mediterranean and to carry out certain operations there.

The enormous value of our present battle-ships, and the length of time required to replace them, emphasize these lessons of history, and if I were to prophesy I should say that every endeavour would be made in future naval wars to attain various objects, such as raising a blockade, the destruction of commercial towns, or the ruin of commerce, without hazarding a general action; and if this be so, the assumption that speed is a secondary object in a battle-ship cannot be maintained. The other erroneous conclusions to which I have referred as frequently drawn from our former naval history are—

1st. It is said that our ships of the line were inferior in sailing to foreign ships opposed to them, the French in particular, and it is urged that as our victories were gained notwithstanding this inferiority, that speed under steam is of little value in large ships whether considered strategically or tactically.

2nd. It is supposed that our naval heroes of the past cared little about superiority of sailing, and that we may do the same.

Now a careful study of naval history in my opinion negatives the assumption that our ships were generally inferior in sailing to those of their opponents, and it is rather the complaint and natural indignation of our Admirals, when for a time their ships were inferior in mobility, which has given rise to the mistaken notion to which I am referring. The contrary was the rule, and bitter complaints were made when from exceptional causes our fleets were inferior in these respects. From the time of the Armada, when the smart sailing "frigates" and "pinnaces" of Howard and Drake, Frobisher and Hawkins, danced round the heavy Spanish ships which they harassed, annoyed, and eventually destroyed by their "policy of worry," mobility was a tradition in the British Naval Service. The unfortunate Byng indeed pleaded that the French ships had "greatly the advantage in point of sailing which enabled them to fight or to avoid fighting as best suited their purpose;" and it is possible that owing to foul bottoms—for ships were not coppered in 1756—the French ships may have had the advantage he speaks of; but it is at least curious that three years later Boscawen in the Straits of

Gibraltar and Hawke off Quiberon won their victories by bringing the French ships to action which were endeavouring to escape. Again in the pages of James we have numerous plaints of the inferior sailing of our ships in 1793 and 1794 at the commencement of the war, and specially in the evolutions preceding the action of the 1st of June; but it is at least significant that two dull sailing three-deckers, the "Queen Charlotte" and the "Queen," managed to get into action on the 29th May, and that courts-martial followed on Captains who had misbehaved themselves. In later periods of the war we seldom hear of similar complaints, and if it be pointed out that the fine sailing 84 "Canopus," of comparatively recent years, was a model of the "Franklin" taken at the Nile, it must also be remembered how often the captured ships although uninjured were sold out of the Service or only used as prison ships. That some French models were superior to English is true enough, but I am speaking of sailing generally, and whether we look to fleets or single-ship actions we shall find the rule to be, that British ships were generally able to bring their enemies to action by superior sailing and better seamanship.

In Nelson's famous chase to the West Indies after Villeneuve we find him leaving the Straits of Gibraltar on the 7th of May, 1805, twenty-eight days after Villeneuve had sailed from Cadiz, yet he made Cape St. Vincent on the 17th July, only a few days later than Villeneuve had arrived off Cape Finisterre, and five days before the latter's action with Calder, which took place on the 22nd July, about 40 leagues north-west of Finisterre. Nelson, indeed, makes no complaint of the sailing of his ships, and in his diary speaks of his run out to Barbadoes and home from Barbuda at an average per day of 34 "leagues wanting 9 miles" with legitimate satisfaction. Let us for a moment cast aside the depreciation of our own constructions, that "faultfindiness," if I may venture to coin a word, which is the heritage of every Briton, endeavouring to "see ourselves as others see us," and we find Suffren chasing the "Ramillies," 74, and other British men-of-war in 1780, and being "completely outsailed" by them, according to Mr. Laughton in his "Studies of Naval History," the English ships being coppered while the French ships were not. Suffren then makes a strong representation to the Minister of the French Navy on the inferiority of sailing of the French ships from this cause. It is satisfactory to note that at least one great improvement was adopted in our Navy before being appreciated on the other side of the Channel.

As to the naval heroes of the past having been indifferent to good sailing, I have already just referred to Suffren's protest; but it is more to our purpose to point to Nelson's constant preference for speed and handiness rather than mere power, as shown by his choosing the "Captain," the smallest 74 in the fleet, before St. Vincent, his shifting his flag from the "St. George," 98, to the "Elephant," 74, before Copenhagen, and his devotion to the "Victory" chiefly from her good sailing qualities. How often and how earnestly he pleaded for fast frigates as "the eyes of the fleet," need scarcely be repeated.

Here is one instance. In a letter to Lord Barham, then First Lord of the Admiralty, dated "Victory," 30th July, 1805, he presses for "*many, many* more frigates and sloops of war" as indispensable.

But is not fast sailing a tradition which has descended to our own days, as shown by the experimental squadrons, and trials of sailing which were the constant interest of the years preceding the Crimean War? I well remember the keen interest in trials of sailing taken by Sir William Parker when he was in command of the Mediterranean, who had himself been one of Nelson's frigate Captains. Thus, then, as I have endeavoured to show, speed and handiness were held in high estimation by our past naval heroes. Seamanship I have scarcely alluded to, but the all-important seamanship of the past, which is so often referred to with regret, meant mainly speed and manœuvring power rightly used. It meant, too, the replacing of spars or sails shot or carried away, and retaining your ship equipped in all respects ready to fight an action. It will be admitted then that seamanship was an important factor in the speed of sailing ships, and when Villeneuve before Trafalgar lamented that his Officers and men were not "*exercés aux tempêtes*," he was practically complaining of the want of speed of his ships, and of their consequent inability to cope on even terms with the British fleet under Nelson.

I have dwelt thus long on the past as I am convinced that a proper appreciation of the lessons of history is an unerring guide for our future conduct; but as I began by stating the motive power was uncertain in former sailing days, and the best combinations of a Napoleon or a Nelson were liable to be frustrated by the fickleness of the wind.

How steam, now that it has attained its present high development, has changed all this! An "Etruria" or an "Umbria's" arrival at Queenstown after a winter's passage across the Atlantic can almost certainly be prognosticated within a few hours, and though our men-of-war at present fall far short of this standard, there is little doubt that our modern squadrons might be made capable of steaming at a uniform rate of at least 12 knots from the Mediterranean to our Southern ports. Whether our ships can do so now or not is foreign to my subject, it is sufficient to point out that hitherto no trial has been made to test their capabilities in this respect; but I do not, I am sure, point to what is unattainable or unreasonable to demand, and I hold that if the strategical and tactical advantages of speed are fully appreciated we shall soon attain this or a higher standard.

Of recent years both the late and the present Boards of Admiralty have aimed at giving considerably increased speed to our men-of-war of all classes, which is satisfactory, as a few years since we were falling behind the French, and still more the Italians, in this respect. The ironclads of the Admiral class and the belted cruizers designed by Sir N. Barnaby form groups of the fastest vessels of the world of their respective classes, and we are witnessing in the last two years, from the designs of Mr. W. H. White, our present Assistant-Controller of the Navy, a transformation of almost all classes of ships into cruizers of extraordinary speed, such as would have been impossible

of attainment some years ago. It may be remarked here that in our two newest and most powerful battle-ships, the "Nile" and "Trafalgar," speed has been sacrificed to protection to some extent, for which there may have been special reasons which I need not discuss here; on the other hand, we see almost daily in the papers of fast vessels of 20 and 21 knots being ordered, of which I may mention the "Medea," "Medusa," and seven vessels of the "Sharpshooter" class to which I propose to allude later.

The following extract from a lecture by Mr. W. H. White at the Mansion House last year shows that he at least does not look upon battle-ships as any exception to the universal demand for speed:—

"Wide differences of opinion," he says, "exist on many, if not most, of the features of war-ship design, but there is almost absolute agreement that *high speed* is of primary importance in all classes. It has been well said that in future naval actions speed will be the equivalent of 'weather gauge' in the past. The swiftest vessels have the power of choosing their range and relative position, forcing or avoiding an action."

The question could scarcely be summed up more concisely. The special value of the weather gauge, though "staled" by subsequent custom into a problematical fighting advantage, consisted in its giving the initiative to its holder to bring on or to avoid an action.

As an actor in our recent manœuvres, I am precluded from doing more than allude to them generally, but it is certain that the necessity for speed was tactically shown in the manœuvres in the Irish Channel, between Baird and FitzRoy, while I had myself very practical proof of its strategical advantages in the British Channel.

Let me touch now on foreign opinion on this subject. The articles of Admiral Aube, late Minister of Marine, and of the late M. Gabriel Charmes, were a song of praise of the torpedo-boat, on account of its speed and invisibility. M. Charmes was quite satisfied that the days of ironclads were numbered, their speed being unequal to that of the torpedo-boats. Carried away by his argument, he seemed ready to assume the paradox that the smaller the vessel the greater would naturally be the speed, a conclusion which would scarcely approve itself to the naval architect.

M. Gougeard, formerly Minister of Marine under Gambetta, in a thoughtful treatise called "La Marine de Guerre, son Passé et son Avenir," published in 1884, comes to the following conclusions. He is satisfied that all must depend upon speed in ocean warfare, and that vessels of 1,780 tons, armed with 6-inch guns, could give a good account of an "Italia." His vessels, though 300 feet in length, and not very handy, would steam 20·5 to 21 knots, and this alone would in his opinion give them ample security. It is impossible to follow him in his extreme argument in favour of speed, but it is clearly the immense development of speed and the torpedo which has given him what he calls this "nightmare without name," and forced him, as we mostly think, to such an absurd conclusion. M. E. Weyl, Lieutenant de Vaisseau, in his more sober articles, "La Marine Anglaise," and his account of the French Mediterranean manœuvres in 1886, whilst he

declines to follow the lead of the wild advocates of torpedo-boats, speaks strongly in favour of speed, asking what figure an ironclad of the old class steaming 12 knots would make against a modern vessel steaming 15 to 16 knots. He is evidently a strong advocate for speed, speaking contemptuously of the numerous "parade vessels," of which, he says, this country possesses more than any other, which are "good for nothing from a military point of view." It is worthy of remark that while M. Weyl appreciates fully the advance we are now making to "make up lost time," he states that in 1880 the French had twenty-five 14-knot ships, the English Fleet having only eleven at that time.

Such is a short *résumé* of French naval opinion. I am here ignoring the torpedo-boat question, as I do not think that the question of the torpedo-boat or torpedo-cruizer superseding the big ship is one of practical application; but it is certain that, as these smaller vessels depend mainly on their speed, they have afforded an additional reason for speed in large vessels as a defence against their attacks. My contention is that all vessels, the large as well as the small, require speed as one of the most important of their qualities; but as it will readily be admitted that fast cruizers acting as the eyes of a fleet, despatch-boats, and torpedo-vessels, must have great speed, I propose to confine my remarks mainly to the action of battle-ships.

Let me then examine shortly the great advantage which would be within reach of a squadron of greater uniform speed to its opponent, and the combinations which would be strategically possible.

A great authority, Admiral Sir George Elliot, in a lecture at this Institution delivered in 1884, has given a scale of qualities necessary for battle-ships in which "speed" is placed fourth on the list for ships employed in European waters, and he holds a 12-knot speed as being sufficient, a view which he has repeated more than once recently.

Let us suppose for the sake of argument that this view had been that of the Admiralty, and that all our British home service ironclads were 12-knot ships. Let me further assume that the French ironclads had a speed of 14 knots. Let us now suppose that war has been declared, and that both at Toulon and Brest, fleets of ten French ironclads were blockaded by twelve British ironclads of about equal force, but inferior in speed by 2 knots.

TABLE I.

From—	Nautical miles.	Time taken by French Fleet.	Time taken by British Fleet.	French Fleet before British Fleet.
		hrs.	hrs.	hrs.
Toulon to Gibraltar	715	59½	71½	12
Gibraltar to Brest	944	78¾	94½	15¾
Toulon to Brest	1,659	138¼	166	28
Brest to Liverpool (direct, outside Smalls)	414	34½	41½	7
Brest to Liverpool (going round Ireland)	825	68¾	82¼	13½
Brest to Greenock (direct)	501	41¾	50	8¼
Brest to Greenock (going round Ireland)	731	61	73	12
Brest to Tynemouth	635	53	63½	10½
Brest to Leith	735	61¼	73½	12¼
Portland to Brest	208	..	21	..
Portland to Liverpool	420	..	42	..
Portland to Greenock	507	..	50½	..

A glance at Table I will show at once the dangerous position in which this country would be placed. The times of the respective fleets reaching the various places are shown on the Table, and I only propose to work out one or two instances. I have assumed a reduction of 2 knots in speed of ocean steaming for each fleet.

I will assume that in accordance with orders from their Government the French Toulon Fleet, taking advantage of a fog or thick weather, has been successful in eluding our blockading fleet without being brought to action, and makes at all speed for Brest. The Table shows that they would pass Gibraltar twelve hours before the British Fleet, which I have assumed to have gone in chase immediately, and they would arrive off Brest twenty-eight hours before the British Mediterranean Squadron. What would be the action of our Channel Fleet blockading Brest? It could scarcely remain off the port to be attacked by superior forces, while any course open to it would have grave objections. If the course adopted were to steer to the southward in order to meet the French Toulon Fleet, the blockade would be raised and the Brest Fleet would be at liberty either to follow the British Fleet and bring them to action on being joined by the Toulon Fleet, or simply to put to sea and sweep the British or Irish Channels,

doing as much mischief as possible. The Toulon Fleet would run little risk in any case. Probably the safest course would be for the Channel Fleet to return to Portland or Plymouth, pick up all available reinforcements, and when strong enough, to follow the French Fleets which we may suppose to have united. This course would have the objection that the British Mediterranean Fleet would be left in jeopardy, but it must be remembered that the French plans not being known, the destination of their fleet, though suspected to be Brest, might be the West Indies or Ireland, so that it would be the most prudent course to concentrate within reach of the telegraph. This is one of the simplest of combinations. It is evident that without any combination at all, a French Fleet of 2 knots greater speed might manage to escape from Brest, and being followed by the British Fleet round Ireland, might appear off Glasgow or Liverpool twelve to fourteen hours before their pursuers, which would give ample time to do great damage to our valuable shipping, while they would quietly slip back to port, declining an engagement. Such a forecast is too ugly to bear dwelling upon. It is a perfectly true one were the conditions such as I have put them, but fortunately we have not been blind to the necessity for speed in our battle-ships, while the French ships from their limited supply of coal are not prepared for the "*grande guerre*" such as I have been considering.

Comparing naval with military affairs, let us just think for a moment what a delay of twenty-eight hours on the part of the Prussians at Waterloo might have been to Napoleon, or a similar loss of time in the arrival of the Crown Prince's army at Sadowa might have represented to Benedek. Hitherto, indeed, the calculation of time and speed in naval operations has been so uncertain that no similar combinations have been effective, but my point is that this is no longer the case. Byron's boast that man's control "stops with the shore" has lost much of its force, and I have a strong opinion that success in future naval warfare will mainly depend upon the recognition of this changed condition.

Let me now turn to the tactical view of the advantages of speed, which I do not propose to dwell long upon as it opens out the whole question of tactics. It is evident that any slow ships in a fleet must take away from its strength, and for the sake of argument I must assume each fleet to be formed of ships capable of similar speed. A's fleet then has a decided advantage of speed of at least 2 knots over his opponent B's fleet. Now it will be seen at a glance that A has the initiative. He has the proverbial three courses open to him. First, he can simply laugh at B, lead him a will-o'-the-wisp sort of chase, do such damage as can be done in a short time, and dodging round an island, or taking advantage of thick weather, return quietly to his own port. But secondly, he may wait upon events, intending to fight B if the latter by separating his fleet in chasing or in any other way gives him an advantage. Thirdly, A may boldly meet B, trusting to the tactical advantage which speed gives him. As this advantage seems to be doubted by a good many naval Officers, I propose to deal with it as far as space will allow, though I endeavoured

to show some of the tactical merits of speed in fleets in a lecture in this theatre two years ago.[1]

Time will not admit of my going closely into this question, but I hold that A is in a position to take advantage of any formation B may adopt with a view to attacking. I am reluctant to show diagrams to illustrate this, as I am sure to be met with the easy philosophy that the B's or the A's would not be so foolish as to act as I have proposed. I would rather that any one of my hearers would give the formation which he would adopt as the Commander of the B's, and I think that I should be able to show how A's fleet, acting at greater speed, could take advantage of it, A always having the power of extending his distance and changing his formation.

Let me, however, take two or three representative cases. B's fleet forms the old line ahead and steers straight for A in that formation. A would clearly be able to take advantage of this attack by forming line abreast, and turning his stern to B, endeavour to crush his van ships by a concentrated fire. The same tactics might be adopted should B endeavour to attack in two columns line ahead. But we will suppose the Admiral of B, with the view of meeting A on more even terms, to turn in *succession* eight points to starboard (or to port). A might at once turn eight points *together* to starboard (or to port), and edging down towards B might bring the fire of all his ships in turn on the ships of B's van. Should B be in two columns this would be even simpler, as unless B turned exactly eight points, "leaders together, the remainder in succession," there would be a gap between B's two divisions.

Let us now assume B to advance towards A in line abreast or double lines abreast, he would expose himself to a concentrated ram attack, but A's safest course would be either to pass along either wing of B in line ahead, or in two divisions "line ahead," or "indented line," to envelop the wing ships of B. Should B alter course eight points either way, we have much the same case as before, but in this case he would be more in danger from the ram.

Let me now leave fleets, and dwell for a time on the tactical value of speed in a single-ship action, which I hold to be even more evident than when fleets are in question.

Clearly the faster ship can choose her range and mode of action. Speed is not everything of course, and I do not wish anything I may say to be taken as advocating the heresy that fast American liners carrying a few guns or torpedoes can cope with even our slow corvettes of the C class. This is indeed only the exception which proves the rule; the improvised men-of-war having neither manœuvring nor gun power, are not fighting ships except against similar vessels, they have only the resource of a "clean pair of heels." But an "Archer" meeting one of the C class might take advantage of her speed to try and torpedo her, and escape if unsuccessful; if she had inferior speed she would necessarily be overwhelmed by her opponent's superior fire.

[1] See Journal, No. 133, vol. xxx.

I will now assume an action between two of our ships differently armed, and I will not take the obvious case of a ship with guns and speed superior to that of her opponent, which might naturally choose her own distance for smashing her by gun fire.

I will take the "Collingwood" and "Conqueror:" the latter has a special weakness in having practically no stern fire, a defect which is common to other of our ships, "Sans Pareil," "Victoria," "Hero," "Benbow." She is smaller and slower than the "Collingwood," but she has a good bow fire of two 45-ton guns in a turret, and fair protection.

Should these two vessels meet as enemies, it is evident that for the "Conqueror" to run away would be suicidal, the "Collingwood" would simply steam astern of her about 1,000 yards and sink or take her with little loss to herself. The "Conqueror" accordingly decides upon showing fight, and turning her bow to her enemy, makes direct for her with a view to ramming. This does not suit the "Collingwood," which moves off, and replies with her two 45-ton guns from the after barbette, taking advantage of her speed to yaw and fire occasionally from the foremost barbette. Now, unless the "Conqueror" has a very marked advantage in turning power over the "Collingwood," such an artillery duel would eventually end in both ships making turning movements in chase of each other, and after a time the positions would be reversed; the "Collingwood" would have first, all her guns in action, and should the action continue long enough, the "Conqueror" will, in due course, inevitably find herself ahead of the "Collingwood," and at the mercy of the latter. Now let me replace the "Conqueror" by the "Sans Pareil," a more powerful and a faster ship, but similarly weak in stern fire; the latter by her superior speed will gradually draw away from the "Collingwood," and force her opponent to endure her bow fire of 111-ton guns, which he cannot avoid except by exposing himself to be rammed.

Now it may be remarked that both "Conqueror" and "Sans Pareil" have special weaknesses objectionable in a fighting ship, in which sentiment I heartily concur, but I have I think shown how, given that a ship has special strength or special weakness, speed is the quality which will enable us to develop the one and to hide the other. My illustration is perhaps not quite complete, as I have ignored to some extent manœuvring powers, but I appeal to Admiral Colomb and others who have made a special study of these subjects, as to whether I am not, speaking generally, justified in placing manœuvring power as secondary to speed in single-ship actions.

It will be understood that I am assuming an advantage in speed for the "Sans Pareil" over the "Collingwood," which she may not perhaps possess when complete for sea. She is, I understand, waiting for her guns, like too many of our other first rates. For the sake of my argument, it must be assumed that "Collingwood" has an advantage of at least 1 knot in speed over "Conqueror," and that "Sans Pareil" has a similar advantage over "Collingwood."

I have now dwelt on the importance of speed as desirable in itself, for strategical and tactical purposes, and I shall be answered by many

TABLE II.

Name of ship.	Displacement.	Speed.	Weights.				Percentage of machinery and coals.	Percentage of armour and protection.	Percentage of armament and turntables or turrets.
			Machinery.	Coals.	Armour.	Armament and turntables.			
* Trafalgar	11,940	16½	1,342 ? 11 per cent.	1,200 10 per cent.	4,230 35 per cent.	1,500 ? 13 per cent.	21	35	13
† Benbow	10,600	16¾	1,292 12 per cent.	900 8·5 per cent.	2,900 29 per cent.	1,329 12·5 per cent.	20 5	29	12·5
† Collingwood	9,500	16½	1,255 13 per cent.	900 9·5 per cent.	2,520 27 per cent.	885 9 per cent.	22·5	27	9
† Impérieuse	8,400	16¾	1,266 15 per cent.	900 11 per cent.	1,500 ? 18 per cent.	500 6 per cent.	26	13	6
‡ Aurora	5,000	18½	830 16·5 per cent.	900 18 per cent.	880 11·5 per cent.	400 ? 8 per cent.	34·5	11·5	8
* Warrior	8,820	14·4	1,016 11·5 per cent.	800 9 per cent.	980 11 per cent.	450 5 per cent.	20·5	11	5
§ Calliope	2,770	13¾	400 ?	500	Nil	200 ?	32·5 ?	Nil	7 ?
§ Medea	2,800	20	600 ?	400	Steel deck weight ?	?	36 ?	Steel deck weight ?	?

* From Mr. White's lectures at Mansion House, January, 1887, and at Institution of Naval Achitects, April, 1886.
† From House of Commons Return, July, 1887.
‡ From lectures by Mr. Biles and Sir N. Barnaby, Institution of Naval Architects, 1887.
§ Navy List, Lord Brassey's Annual, and calculation. Against the latter I have placed a ?.

naval Officers that no one doubts this, that other things being equal, no one denies its value on certain occasions at all events, but—and there is much in this but—is it wise to sacrifice so much of protection, so much of gun power, and above all, coal capacity, to mere speed?

I might reply shortly that this is mainly a naval architect's question, that I personally am satisfied that hitherto at least the game has been worth the candle, and that the sacrifices which have been made to attain speed in our "Admiral" class, and in "Sans Pareil" and her sister ship the "Victoria," have not been excessive, thus leaving the question; but I am disposed to go a little further and to see what sacrifices have been made, or require to be made, to attain speed. Coal-carrying capacity is so important a factor in speed that it should not be reduced, and must be considered as a part of speed. That the French have dangerously reduced the coal capacity of their ships I have already stated, and they have thus seriously hampered themselves from undertaking extended operations. Sir N. Barnaby, in a lecture at the Institution of Naval Architects last year, arguing that the 900 ton coal supply of the "Impérieuse" was unreasonably large, gave a list of thirteen foreign ironclads with coal capacity of 400 to 650 tons, among which we find the "Courbet" of 9,500 tons displacement only carrying 600 tons of coal; our "Collingwood," on the other hand, as shown by an official Return of 15th July last, though of only similar displacement, carries 900 tons. I do not wish here to go into the vexed question of "legend weights," but I rejoice that, in deference to a great extent to the views of naval Officers, we have declined to follow the French lead in reducing the supply of coal, and have insisted that while the capacity of bunkers should be large, the common sense course should be followed of filling up to full stowage.

In order to show as nearly as possible the sacrifices which have been made to attain the requisite speed, I have drawn up Table II, which I regret not to be as complete or as accurate as I could wish. I have, however, shown clearly what is taken direct from authentic sources, and where I have placed a note of interrogation the calculation has been made by ratio of I.H.P. to weight and in other indirect ways The Table speaks for itself, and will enable any one to see at a glance the increased demands which have been made for weight of machinery and coals to attain speed. It is strange at first sight to find the "Warrior" with as large a percentage for machinery and coals as the "Benbow" or the "Trafalgar," but this is due to the improvements in machinery. A table of Mr. White's, to which I have before referred, shows the "Warrior" as developing only 5,469 I.H.P., with a weight of machinery of 884 tons, while the "Howe" developed 11,613 I.H.P. for a weight of 1,152 tons. Table III is a fairly up to date list of modern fast cruizers of our own and foreign navies.

TABLE III.

Showing Details of the Fastest War Ships in the World, built and building (Torpedo-boats excluded).

Nationality.	Launched.	Name.	Displacement.	Ind. h.-p.	Speed.	Coal capacity.	Heaviest guns.	Remarks.
Spain	1886	Destructor.....	400	4,000	25	..	3½" B.	Torpedo catcher.
Turkey	Building	(Unnamed)	450	2,700	21	127	..	Torpedo gunboat.
Italy	1887	Confienza and 4 others	730	3,600	20	180	Q.-F. 6-pr.	Torpedo cruizers.
„	1886	Folgore ..... Saletta.....	312	2,400	20	90	Q.-F. 6-pr.	Torpedo catchers.
Spain	1887	Reina Regente ..	4,800	11,000	20·5	1,100	4 7" B.L.	Deck-protected cruizers (5" steel on slope).
„ ..	Building	Lepanto						
Britain	„	Medea ..... Medusa	2,800	9,000	20	400	6" B.L.	Steel-protected decks.
„	„	Melpomene ... Marathon ..... Magicienne ...	2,950	9,000	19·5	400	6" B.L.	Do. sheathed with zinc.
Russia	„	Sacken ..... Ilyen	600	3,500	20	..	..	Torpedo cruizers.
Britain	„	Sharpshooter and 6 others.	735	4,500	20	..	..	Torp. gunboats last ordrd.
„	1886	Aurora and 6 others	5,000	8,500	19	900	2 9" 22-ton B.L. 10 6" B.L.	Belted cruizers.
„	1887	Grasshopper and 4 others...	450	2,700	19·5	100	4" B.L.	Torpedo gunboats.
France.....	1886	Alger and 3 others.	4,000	..	19	..	6 5" B.L.	Deck-protected cruizers.
„	1887	Cecille	5,680	9,000	19	..	„	„
„	1887 & buildg.	Tage	6,950	10,330	19	1,000	„	„
„	„	Surcouf and 5 others	1,800	6,000	19	..	5 5" B.L.	Corvettes 1st class.
„	1885	Bombe ..... Coulevrine ...	320	1,800	19	..	4" B.L.	Torpedo despatch boats.
„	Building	Chanzy and 2 others	3,027	9,000	20	480	6" B.L.	Cruizers.
„	„	Mogador	4,325	8,200	19	..	„	„

TABLE III—*continued.*

Nationality.	Launched.	Name.	Displacement.	Ind. h.-p.	Speed.	Coal capacity.	Heaviest guns.	Remarks.
Germany ...	Building	Lorelli and 3 others	2,000	5,400	19	300	6″ B.L.	Deck-protected cruizers.
Italy	1885	Dogali	2,200	7,600	19·7	..	6″ B.L.	,,
,, ...	Building	(Unnamed)	2,200	..	19	..	6″ B.L.	,,
Austria	1887	Ferd. Max.....	5,020	11,000	19	400	12″ 48-ton Krupp	Ironclad barbette, 9·5″ steel belt.
Greece.....	Building	Narcissus.....	5,000	8,500	19	900	10″ 26-ton B.L.	Belted cruizer, 10″ compound belt.
America.....	,,	Baltimore	4,400	10,500	19	900	8″ B.L.	Part deck-protd. cruizer.
,, ...	,,	Newark	4,030	..	19	800	6″ B.L.	,,
,, ...	,,	Charleston	3,730	7,500	19	800	10″ B.L.	,,
China	,,	(Unnamed)	450	2,700	19	100	4″ B.L.	Torpedo gunboat.
Japan	1885	Namina ..... Takachiko.....	3,750	7,500	19	800	10″ 30-ton B.L.	Deck-protected cruizers.
Britain	1887	Iris and Mercury..	3,730	7,330	18	780	6″ B.L.	Despatch vessels.
,, ...	1885	Mersey and 4 others	3,500	5,700 to 6,000	18	750	8″ B.L.	Deck-protected ships, 3″ steel slope.
France	1884	Milan.....	1,520	3,800	18	..	4″ B.L.	Corvette 1st class.
,, ...	81 to 86	Dague and 3 others	320	1,800	18	..	4″ B.L.	Torpedo despatch vessels.
Germany....	1887 & buildg.	Ariadne..... Elizabeth	4,250	8,000	18	800	6″ B.L.	Deck-protected cruizers.
Italy	80, 82, 87, and buildg.	Italia, Lepanto, Re Umberto, Sardyna, Sicilia	13,857 13,257	18,000 19,000	18	1,650 1,200	17″ 103-ton B.L.	Barbette shield, no belts. 19″ compound on barbette.
,, ...	1883	Etna and 3 others..	3,530	6,000	18·2	..	..	..
Austria	1885–1886	Leopard and 2 others	1,530	6,500	18·3	250	4·7″ B.L.	Cruizers.
Chili	1883	Esmeralda	3,000	6,200	18	600	10″ 24-ton B.L.	Cruizer.
China	Building	Chih Yuen.... Ching Yuen ..	2,300	5,500	18	500	8″ 12-ton B.L.	Cruizers.

The total number of ships in this list is 98, belonging to the following countries:—British, 31; Italian, 18; French, 23; German, 6; Austrian, 4; Chinese, 3; Russian, 2; Spanish, 3; American, 3; Japanese, 2; Chilian, Greek, and Turkish, 1 each. The number of British ships ordered to date being inserted, probably give us an unfair advantage.[1]

The recent improvements in the marine engine have in fact been so great as to amount to a revolution in naval warfare, as they have already revolutionized trade. They have been aided by improved forms, but the possibilities in the way of speed have been mainly opened to us through steam pressures of 150 lbs., triple expansion and better metal.

It is worth calling attention to the enormous increase of I.H.P. required to attain extra speed when a high rate has already been obtained, for which I am again indebted to some tables of Mr. White's.

H.M.S. "Howe," for instance, steaming 15 knots with 6,000 I.H.P., required 12,000 I.H.P. or just double for her extreme speed of 17 knots. It is calculated that the "Trafalgar" will steam 16·5 knots with 12,000 H.P.; but that 7,000 H.P. would have been sufficient for 14·5 knots. The "Medea" again requires 9,000 H.P. for 20 knots; at 18 knots 5,500 H.P. would have been sufficient. The "Iris," a vessel 1,000 tons larger, steamed 18 knots with 7,300 H.P.

I have given some idea of the difficulties which have had to be met and overcome by our naval architects and marine engineers to attain the great speeds now demanded, and I could go further and point to the differences between men-of-war, required to steam at various rates of speed, and merchant vessels, and between engines for heavy and light ships, but I must draw to a close and point to a few practical lessons.

If I am right as to the strategical combinations which are now possible, it becomes more and more necessary that our engineering staffs should have frequent practice in working the powerful engines at full speeds for runs of 1,000 miles or more. There is little difficulty about it if the British public understand that the coal bill must increase very decidedly. We have, I rejoice to say, entirely broken away from the foolish craze of the "most economical rate of speed" which acted as a premium on inefficiency, and already we see a marked improvement in the steaming of our ships. Practice and nerve, too, are required to work the giant engines at revolutions of 100 or more, and practice must be allowed.

[1] Exception having been taken to the accuracy of this table by such a high authority as Mr. W. H. White, who thinks it unfair to British ships, as the speeds mentioned for foreign vessels were not obtained with full bunkers, I wish to explain that this was not intended to be assumed, and that I am aware that no exact comparison of speed is possible, as I do not pretend to know the exact conditions under which various Governments have tried their ships. I believe the speeds given for the French ships are without forced draught, which gives our ships a nominal advantage over those of our neighbour and greatest rival.—E. R. F.

I have heard that when the "Esmeralda" was on her trial trip with Chilian stokers, the latter clean bolted when the higher speeds were reached; and I am certain that many in our engine-room departments have thought occasionally of doing the same in like circumstances, but familiarity fortunately breeds confidence as well as contempt. I know that I ran out to Gibraltar from Plymouth at an average of nearly 12 knots in the "Dreadnought," in 1884, and if I recollect rightly the "Inflexible" did even more. If these by no means fast ships could do this, why not a squadron?

We want, too, practical trials as to the possibility of turret ships keeping the sea and making a passage at speed in dirty weather in the Bay. Are the barbette vessels better sea-boats, and better able to steam fast? Have the écheloned turret ships any advantages at all?

I am glad to see that the Admiralty are moving in these directions; and if the coal bill can be got over, we shall probably move faster. It is sad to think that in these remarks about speed I have had little or nothing to say about sails; but so it is. Let us recognize at once that the old seamanship is only an accomplishment, and an interesting relic, and that the chief engineer and the engine-room department have a far greater part in the seamanship of the present than we like to acknowledge.

To sum up, in conclusion, the lessons which I think we should derive from the more recent developments of the marine steam engine, and the weapon which it has placed within our grasp, I am not blind to the necessities, so far as I can see at present, of protection for fighting ships, while the melinite shell, the dynamite gun, the torpedo, and the submarine boat, all demand attention, but I hold firmly that the greatest changes of all in naval warfare must result from the giant motive force which will enable combinations to be made, hitherto undreamt of in our philosophy.

I repeat that the threatened "*guerre de course*," and torpedo attack, assume mainly a superiority of speed, and that they must be met by similar weapons.

Naval campaigns and naval operations must be thought out beforehand, and carried out with a quickness and vigour which the more leisurely operations of former days did not demand. This is what directly results from the power now at our command, and I hold firmly that it takes precedence of all other factors in naval warfare.

Admiral SELWYN: I desire to corroborate all that Admiral Fremantle has said about the importance of speed. At the Institution of Naval Architects some ten years ago, I ventured, in opposition to a great many of my colleagues then, to put it first and not second, before manœuvring power or anything else; but I joined with it in doing so, that condition of "bottom" as well as speed, that is to say, durable power and speed, which should also be given, and then I believe it would be found that the attainment of high and lasting speed would introduce a totally new condition of circumstances, in which we must attend to the speed of fleets first, and never attempt to put ships together in a fleet which do not possess similar speeds. If that is not done, it is quite clear, as the manœuvres showed the other day, that you tie down the whole fleet to the speed of the sluggard, and under those conditions you must choose between abandoning your consort or fighting an action at a

disadvantage. If the fast ships could all go at the speed which Admiral Fremantle has shown, I should be delighted for one; but I am sorry to say, in the published books on the subject, I am told that while all the foreign ships may be relied upon for the speeds given, because the speed has been tried, not at a trial trip, but at sea, under command of the Officers and crews, and so reported on, we cannot rely on the published speeds of the British ships without a deduction of about three knots per hour from the stated speed. I am not the authority for this statement, it is a statement made in Lloyd's and other lists. The first thing to remedy that state of things is to know what their speeds are; and till we know that, by that very process which Admiral Fremantle has so very well pointed out, of allowing trials to be made under conditions not particularly favourable, but which give us a clear idea of how fast we can really expect to go, we shall never know what we are doing. I have done my utmost to increase that most important question the "bottom," that is to say, the fuel-carrying power of ships. The Russians have been before us, and have fitted an ironclad, the "Tchesmé," of 10,000 tons, with oil fuel, and they have acquired by that very fact the power of just doubling the tonnage of fuel carried by any similar steamship in the world—tonnage of fuel, not of coal. The question must necessarily come to the front. Admiral Fremantle does not in the least overestimate the value of speed; but he points out that it is an absolute necessity for all, and I cordially agree with him. I say this is to be arrived at first by increasing the pressure in the boilers, and secondly, by carefully condensing the fuel till every combustible gaseous substance is perfectly utilized. Not the oil alone, I have long gone past that, but every gas there found, so as to produce what I have produced over and over again, though a great many people are slow to believe it, 46 lbs. of water evaporated for every lb. of fuel used. That can only be done by following what Professor Dewar at the Royal Institution has so well shown, the combustion resulting from the temperature of the electric arc; he shows the compound substances resulting from the perfect combustion, including not only the oxygen of the atmosphere but the nitrogen, and as we know perfectly well that the nitrogen in gunpowder even is one of the strongest elements of combustion, so we shall find by-and-bye that we are able to get results by careful chemical study, such as will not only throw into the shade the speeds hitherto obtained by fast ships, but also will bring up all the ships that are now lamenting want of speed, very much higher than is now considered possible.

Admiral COLOMB: This is a paper which ought to be discussed very carefully. I think in this Institution we often listen to papers which we can truly call "able," but at the same time we go away after hearing them, and find that we have not carried very much with us: that is to say, the papers have been able, but not so useful. I think we must all characterize this paper as extremely able, quite worthy of the author's reputation in that way, and beyond measure useful. I have been myself very much struck with the method of treatment adopted. For some years past, I have formed the conclusion, and I am glad to see that it is a conclusion being generally adopted now, and completely adopted by the lecturer, that the proper method of treating these questions in the first instance is the historical method. All through our former wars this question of speed was just as prominent as it is at this moment. The only difference is that the speed now is very much greater than it was, that we now can talk of 18 knots when our ancestors talked of 7 or 8. But the relative value of speed, I take it, cannot be altered to any considerable degree; and that, therefore, when we come to the historical method, we may be pretty sure, as the lecturer puts it, that we are on solid ground, that we shall not make mistakes now if we follow it. I take it, the real question which is at the bottom of this lecture is not whether we shall continually get the greatest speed we can out of our ships, because I believe we are all agreed upon that point, and if we were not agreed, it seems quite certain it will be done all the same, because it is the great struggle of the day to increase the speed. But, I take it, the real question is, are you to make for the battle-ship, the ship which is built entirely to fight in fleets—are you to make the same sacrifices in attacking power, and in defending power, to get speed, as you would make for the cruizer? It is quite certain in going back to history, that they did make larger sacrifices in power for the sake of speed in the frigate than they did in the line-of-battle ship. The lecturer

will, I have no doubt, now that I put it in that way, in concluding the debate, dwell upon that point for a moment, and let us have, as I am very anxious to have, his clear thought upon that single point. Sir George Elliot has always, at any rate since 1858 and, perhaps before, been strongly in favour of making a marked difference between the battle-ships and the cruizer in that matter of sacrifice of speed. Now in speaking of this paper, I find myself not in a position to criticize it, because on reading it at the first blush I go almost entirely with it. I find myself more in the position of offering reflections on it, side lights, as they call them, here and there, in order to bring out the points, and in order to satisfy myself how far I agree, and how far I disagree. I think the lecturer is very right to put speed and coal endurance together, and to refuse to separate them. I think it is the true way of treating the matter. Whenever you use the word "speed" you must include in "speed," "coal endurance." They are inseparable. Then consider: we have to think of speed in two ways: there is speed as speed by itself, and there is speed as certainty. The rate at which you can go from one point to another is one thing; the certainty with which you can arrive at one point from a distant point in a given time, seems to me to be a different thing. I think the lecturer brings that out because he feels some little uncertainty, which I share, as to whether some of the ships with great speed nominally will be able to preserve that speed when they come to face the sea, that is to say, they may have great speed as speed, and yet they may fail to some extent when speed is considered as a certainty. A dead foul wind and a heavy sea may make it uncertain what the length of their passage from point to point may be. Then we pass from that to the true division of the strategical value and tactical value of speed. The strategical value of course operates in both ways, and the certainty of passing from point to point in a given time is everything in strategy; and then simply as speed, that is, relative speed, it becomes advantageous when your passage from point to point has to meet the passage of some other fleet from some other place to the same point, whether you can get there before it, in point of fact. So that I think the strategical value of speed is absolute, there is no question about it, you must have speed and certainty as the all-important matter for naval strategy. When we come to the tactical value of speed, it seems to me we pass away from the question of certainty, and come entirely to the question of superiority and inferiority of speed, that it is the relative speed that has to do with tactical advantage. Considering the strategical value in detail, I do not find myself quite in agreement with the lecturer. I think it is a very large order to anticipate that a French fleet would escape from Toulon in the presence of a superior English fleet or of an equal English fleet. I do not see quite how it is to be done. Having thought it out to some extent, I find the difficulties are so great that I do not think it would be possible for a fleet to escape in that way. But then I have to go a little further and say that I do not think that any grand ironclad fleet would escape from Brest with only the object of a twelve hours' attack on Liverpool at the end. I do not know what object could be attained by a grand fleet with twelve hours only at Liverpool. I think if the strategical object of the imaginary fleet, which has been spoken of as escaping from Toulon, had been the raising of the blockade at Brest, and the bringing to action of the squadron there, then I think the attempt to escape from Toulon would be justified and might be made, but not for twelve hours opposite any commercial port that ever existed. I must make a remark about what I call the scare at present which hangs round the commercial ports. It is a comparatively new scare, you may trace, if you like, its rise. I believe myself it has arisen because we first had submarine mining, and it was discovered that the only way in which we could use submarine mines in this country was, in the defence of our commercial ports up estuaries; and that hence people dwelling upon the idea of using submarine mines, have come to dwell upon the idea that organized ironclad fleets are going to make attacks on commercial ports which are up difficult estuaries; but that is all by the way. Returning to the tactical value, we come first to the question of whether a fleet superior in speed to another fleet can choose to accept or decline battle. I doubt it a little. If the speed of fleets were absolutely uniform, if every ship, as Admiral Selwyn has said, had precisely the same speed, I think that would be so; but as that has never yet been so, neither in old times nor in the present time, it

seems to me that the slower fleet might by the use of its faster ships generally bring on the action. With single ships, on the contrary, I hold with Admiral Fremantle that it would be so, that the faster ship would bring on or decline action as she thought proper; but both with the single ship and with the fleet, it seems to me that the speed has more to say to determining the form of the battle than to any particular advantage which might be gained in it, and that therefore to gain all the tactical advantage of speed, you must arm your ships in accordance with that idea. It has been very well brought out by the lecturer that those large ships which are armed at the bow like those mentioned, the "Hero," the "Conqueror," and so on, are under a disadvantage because their armament does not coincide with the idea of their speed. If they were to make the best use of their high speed, their guns would be placed astern and not ahead. The lecturer has shown, and I think rightly, that given the bow armament, if you must have it, you do not make it worse at least by adding speed to the ship. I am very glad to see the lecturer dwell upon the necessity of not following the French standard as to coal endurance. I was greatly astonished when Sir Nathaniel Barnaby excused the shortness of coal supply in some of our ships on the score that the French had also a short supply. If I understand things aright, the duties that English men-of-war will have to do, and must be prepared for, are totally different from those which the French ships will have to do, and be prepared for, in war; and therefore I think we need not in the slightest degree trouble ourselves with what the French do in the matter of coal supply, but we must provide a full supply for the duties that we ourselves shall have to do, which can be very readily made out beforehand by a reference to what was done in former days.

Captain CURTIS: I am one of those who think it quite possible for the French fleet, if they could get the heels of the English fleet, to do considerable damage at Liverpool.[1] Therefore, I should like to see the day when all round our coast there would be telegraphic communications, and when every creek capable of floating a torpedo-boat should contain one or more, so that these torpedo-boats might concentrate where and when desired. The "Alabama" eluded the "Kearsage" off Madeira, notwithstanding she was observed to leave the anchorage. I think if some of Byng's Captains had been shot as well as the Admiral, it would have served them right. It appears that four or five of the ships had to sustain the whole brunt of the action with the French fleet, whilst the rear of the English fleet did not come into action. Now I maintain that if those vessels had been steamers, we should have had a decided advantage, and the Captains would have had to take the responsibility, notwithstanding what their orders were, to await their turn to attack the enemy. Speed, improvement of engines, and also of screws, are all very important matters. I take it that ships, instead of being boxes, as they comparatively are, should be cylindrical; they would then contain just as much, or more, in the way of engines and so forth, and would have greater speed. The form of a ship should be, in my opinion, a prolonged ovoid, with well rounded-up quarters; there should not be a straight line in the ship, she would be a much better sea boat. The old "Rodney" was comparatively a flat-bottomed vessel; she rose like a duck, whilst the "Symonites" rolled considerably. If our ships are to be masters, they must be something of that form. Admiral Fremantle talked about the "Esmeralda" vibration. I have a friend, member of a large engineering firm, who tells me that they build their engines as light as possible, and it is wonderful how they stand the wear and tear that they do. It is certain the ships must be braced up considerably. The increase of speed is due partly to what the late Mr. Griffiths used to advocate, placing the screw so as not to detract from the following or inflowing water (which the sailors call dead water). That is the right position of the screw, as you thus obtain more speed and better manœuvring power.

Professor LAUGHTON: There is one point on which I think stress should be laid, and that is, the necessity of giving the stokers and engineers practice in working at high speeds. It is not only nerve that is wanted, but the manual dexterity

[1] I well remember the flutter at Liverpool just after the "Trent" affair in 1861 hastily arming the old batteries, and sending for a frigate and gunboat.

which can only be acquired by practice. It was reported in the newspapers that the Chilian stokers burnt the bottoms out of the "Esmeralda's" boilers as soon as they took charge. Clearly it is of very little use for naval architects to give ships a speed of 17 or 18 knots, if the first thing the stokers do is to burn the bottoms out of their boilers. Perhaps the story about the "Esmeralda" was not true; but, true or false, the necessity for practice remains the same.

Admiral BOYS: No reference has been made yet to one point which I would like to mention with regard to speed in Her Majesty's ships. I agree with the lecturer as to the importance of the relative difference to be observed between the speed of our cruizers and battle-ships. But with respect to the speed of all ships, there is one element which has not been mentioned. I think that in such Tables as those before us, which are compiled for the information of Officers, there ought to be a column in which the time when a ship was last in dock should be inserted; because the speed of the ship depends almost altogether upon the state of the bottom, and in the ships "Conqueror," "Sans Pareil," and "Collingwood," that the lecturer mentioned, the difference of speed is such that if one should happen to be six months out of dock and another clean out of dock, the relative speeds would be reversed. That is a point to be greatly considered in reference to speed. With regard to coal stowage, the Table II is approximately correct; but in illustration of what I want to point out, I must refer to my old ship the "Warrior;"—it is put at 800 tons—that is, a little too much for stowage in bunkers.

Admiral FREMANTLE: It is 790 in Brassey's book.

Admiral BOYS: That is near enough for our purposes; but I have taken that ship to sea with 1,200 tons on board, and not the slightest interference with fighting efficiency (except some slight reduction in speed from increased immersion), the guns clear, the magazines clear; so that we could have fought an action. No doubt there was some inconvenience, but still it only shows that in all these reports where the coal stowage is stated to be so much, it is a very expanding quantity, and more than is given, in the capacity of the bunkers, can be carried in cases of emergency. With regard to the speed of battle-ships—that is, ships that are to fight and cruize with fleets—it is a greater necessity, I think, to have the power of a short spurt of extra speed, say for an hour or something less than an hour, than that ships in a fleet should have very continuous speed-power to make long voyages and steam from point to point. I attach great importance in a general engagement to a battle-ship being able to make a dash from one position to another, to assist perhaps a disabled ship or drive an attacking force off, that she should have great mobility and speed for a very short space of time (I believe we have acquired this to a certain extent); but I think it is more important than the actual continuance of a less high speed for a prolonged period.

Captain KINGSCOTE: I can corroborate what Admiral Boys has said as to loss of speed, for I can state that the "Curlew," the vessel I lately commanded, in nine months dropped 3 knots of speed through a foul bottom. There is also another remark I should like to make, and that is, that this dreadful word "legend weight," in connection with speed trials, ought to be done away with, and that all ships should be tried with their full coal capacity on board. The "Curlew" was tried with a "legend weight" of 80 tons. She should carry 160 tons, but when she had 160 tons of coal on board, she dropped her speed nearly 2½ knots.

Admiral COLOMB: I think it would be as well to point out that the "legend weight" is done away with, that is to say, the trials are ordered to be made, as was announced by the First Lord in March, with full weight on board. And upon the other point, the mile speed is no longer to be the test, but four days' clear run is to be the test in future.

Captain FAIRHOLME, R.N.: I feel a difficulty in speaking on this subject, because, being chairman of a Company which has a good deal to do with coaling Her Majesty's ships, I might be considered to be interested financially by it. With regard to the remark of Admiral Boys with reference to the "Warrior," I also think that the influence of our little friends the barnacles and oysters have not been sufficiently taken into account in relation to the question of speed. I had already taken the liberty of calling Admiral Fremantle's attention to an interesting point about the recent Channel operations. In the official Report it is stated that

owing to the inferior steaming powers of the "Black Prince" and "Iron Duke," Admiral Fremantle's squadron could not maintain a speed of more than ten knots. I made special inquiry with reference to the "Black Prince," because she was coated with the composition which our Company supply, and I found as a curious fact that the delay to that squadron was probably due to that vessel having no anti-fouling composition on her at all. She had been last coated, but with protective varnishes only, in September, 1886, and had since been lying in Hamoaze, in the most fouling water in the kingdom, and for some reason she was sent to sea from the Hamoaze without being docked to clean and get her anti-fouling coat, and has never been in dock since, so that she was probably in a very foul condition indeed. As a Naval Officer, I can only have one object in view in such a question as this, namely, the good of the Service, and the best composition, no matter what it is, would be what I should wish to recommend. The Admiralty are carefully going into the question, and making trials, and no one knows better than Admiral Colomb how carefully the thing is being worked out. I am simply desirous of pointing out the fact that the question as to any ship having been lately in dock or not, and consequently the question of dock accommodation on foreign stations, has a very great deal to do with the question raised by Admiral Fremantle. I am sure that the Admiralty are so carefully testing the question of all sorts of compositions now, only in order that the best should eventually be selected.[1]

Captain CURTIS: With regard to what I said about Admiral Byng's Captains, I may state that I simply show my conclusions from the reports of the engagement in Clerk's "Naval Tactics."[2]

Mr. W. H. WHITE: I came here to day in order that I might learn the opinions of Naval Officers in matters relating to the designs or qualities of Her Majesty's ships. I did not intend to speak, but some remarks that have been made I cannot very well leave unnoticed, as I happen to be here. First of all, I should like to say that Captain Kingscote's statement that the "Curlew" loses 2½ knots of speed when she takes in 80 tons more coal than her "legend quantity" cannot be admitted to be quite a full representation of the case. If the "Curlew" lost 2½ knots of speed on an occasion when she had on board 80 tons of coal more than she had on another occasion, there must have been many other circumstances that contributed to such a considerable loss of speed. If the "Curlew" were taken out to-morrow with 80 tons, and the next day with 160 tons on board, then the difference of speed between the two trials would be but small as compared with the 2½ knots mentioned. With reference to the effect of a foul bottom upon the performances of the "Curlew," or of any other small ship of relatively high speed, there can be no difference of opinion whatever, and there is no doubt that in connection with the docking and cleaning of the bottoms of Her Majesty's ships, regulations which did well enough for the speeds of former days require reconsideration, and are being reconsidered with reference to the conditions of the present time. There has been a good deal said to-day, also, about the "paper" superiority of English

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[1] The question of speed in the case of the fast cruizers of the present day is one which is almost entirely dependent on the good or bad anti-fouling qualities of the composition employed. Enormous sums are paid for securing the greatest possible speed, and, as so clearly shown by the Tables in Admiral Fremantle's paper, the expenditure of coal rises most rapidly for every additional knot gained in speed. Unless, however, such a vessel be coated with a composition possessing enduring anti-fouling qualities, her speed rapidly becomes so affected that the advantages so dearly purchased are completely lost, and her value for war purposes is correspondingly impaired.—C. F.

[2] Plate VI, Part 1, page 52. We should bear in mind the exploits of "Van Tromp in 1652 and De Ruyter in 1667," also the gallant action of the Captain of the "Nightingale" frigate on 5th September, 1708 (See "Field of Mars, Thames Mouth"), how he defended his convoy, saved it, but lost his vessel; his sword being returned to him. It is not the business of foreign men-of-war to run against ours, if they can avoid it, but to destroy our commerce.

ships over foreign ships in their speed trials. It has been stated—I quite agree that Admiral Fremantle said he does not give his own authority for it, but he quotes from some published accounts—that the speeds of foreign ships are genuine speeds—I am putting it in the plainest English I can—but the speeds of English ships are bogus speeds. I entirely challenge that statement. Having a full knowledge of the conditions of the trials of foreign ships and of English ships, I say that if to-morrow any English ships were put alongside any foreign ships of approximately the same size with equal reputed speeds obtained on the official smooth water trials, the differences in their performances would be unappreciable, or that any differences in speed which appear in our Tables would be shown in fact. I say more than that, that under the present conditions of trial of Her Majesty's ships, the tests are more severe than in any foreign navy. We are making now all over the world trials which continue four days without cessation with the crews of the ships simply to work the machinery. Those ships are started and run for ninety-six hours to cover a distance. It may be stated, as a matter of fact, that on many of these trials, made under these severe conditions, from 70 to 80 per cent. of the horse-power obtained on the measured mile has been obtained for four days on end. Such results as these are surely sufficient to dispose of this loose, and, as I think, unauthorized statement of which so much has been made. I think, moreover, it is a highly satisfactory thing to find that the ships of the Navy, with their own crews and their own stokehole complements, can on trial on actual service, when the order is given, make such a long run at speed and perform so well. The question of what the speed of a ship shall be, of course, depends upon endless circumstances. Admiral Colomb has referred to some; there is the state of the weather in relation to the size of the ship, the state of the bottom of the ship at the time; one may add the condition of the coal she happens to have on board, and a great many other circumstances, all of which tend to influence the actual performance of a ship at a given time. Well, then, clearly the only fair means of comparison is to try every ship at her best, and to compare those results. You can get no other actual and just comparison, and that is the justification of the measured mile trial, nothing but that. No one, unless he is more misguided than, I think, most shipbuilders are, would dream of saying that one of Her Majesty's ships should go out of port, and continue running at her measured mile speed. Whether she has forced draught or not, is not the point. We see, I repeat it because it is a matter of the greatest importance, that trials made in Her Majesty's ships are more severe and more stringent than those made in the corresponding ships of foreign navies, and that under these best condition the results that we obtain are in favour—actually in favour, not on paper but in fact—of the performances of the English ships. I have noticed in this discussion continued reference to "sacrifices" made for speed. If I might be permitted to say so, I think that is an entirely wrong view of the case. If you set out with the idea that you will obtain certain qualities in the design of a ship, a certain armament, certain speed, certain coal endurance, at a certain price, you may then with this *money limit* speak of sacrificing some feature to obtain and develop others. But if instead of that you set out irrespective of cost, irrespective of the money value of the fighting machine that is to be taken into action, and exposed to terrible risks, then there is no sacrifice at all, but that of money. It is not sacrifice of qualities, it is a question of expenditure. Given any association of qualities, if you care to pay for it, you can have more speed. If the battle-ship is wanted to be two knots faster, other things remaining the same, there is no difficulty whatever in doing it, except paying the bill. I am glad to see here to-day my old chief, Sir Houston Stewart, to whom the Navy owed so much during his period of service as Controller, and I can bear witness to the efforts that he made long ago in the direction advocated to-day by Admiral Fremantle. It is now ten years at least since this movement in favour of higher speeds in the ships of the English Navy began, and it has been consistently followed ever since that time. Of course the question how far it should be applied was a question of what ships were building, and what money could be obtained. But it is true that from 1878 to the present time we have relatively, and class for class, as compared with foreign navies, been keeping up the speeds of our ships, and if anybody wants to know what our most powerful neighbours think, they have only to read foreign publica-

tions, and they will find officials—not irresponsible writers—officials such as the Reporters of the Budget Committee of the French Navy, lamenting the inferiority of speed of French ships as compared with the English. In regard to the association of speed with coal supply, I think there has been a very great confusion indeed as to what was really meant by this much-discussed and much-abused "legend weight." The question is entirely this—I am not speaking now of any relation of armour-belt of the ships to the water-line—but simply on the ground of speed and coal endurance. If you have a vessel like the "Collingwood," of which the bunkers can hold 1,200 tons of coal, and you try her with 600 tons, you get a certain speed, and if you immerse her till she has 1,200 tons, you get a certain less speed, which in that ship on the measured mile is represented by a quarter of a knot. I am not now speaking of opinion, but of fact. Now it is a matter quite for choice, as long as the facts are fairly stated, whether you will call the speed of that ship, what you get with her bunkers half full, or what you get with her bunkers full. If you say the speed of the "Collingwood" is, say, 16¼ knots with 900 tons of coal, then probably it will be 16¼ with 1,200 tons; as long as the facts are stated there can be no confusion. But the confusion has arisen from a want of association of the coal carried at the nominal speed, and that confusion prevails to an extraordinary extent in Table III of Admiral Fremantle's paper to-day. For example, we have a vessel which is a grand ship of her class, the "Reina Regente" of the Spanish Navy. She is put down as having a speed of 20¼ knots, and a coal capacity of 1,100 tons. It is perfectly true that the "Reina Regente" has a speed of 20¼ knots. I have been on the ship when she made that speed, but it is not true that she has that speed with 1,100 tons of coal in her bunkers. Then, again, if we go down the list, and take the "Medea" class of 2,800 tons; one must speak with some hesitation of a ship not yet tried, but she is to make 20 knots with 400 tons of coal on board, and the "Reina Regente," a vessel much larger, made 20¼ knots with a little more than 400 tons of coal on board, I believe 500 tons. Then we have the "Destructor," again a most successful vessel, put down as having obtained a speed of 25 knots. I do not think she ever did it, but independently of that, the speed so given for the "Destructor" was a speed with much less than her full weight and equipment on board. The contractors undertook, and fulfilled their contract, to build the "Destructor" to steam a certain speed with a certain load, but not the full equipment of the vessel. You will find a very remarkable illustration of this in the "Lightning," our first first-class torpedo-boat, which made about 18½ knots with a certain load on board; but when the boat was fully equipped, her speed was only 17 knots, though the engines were working just the same. There are many other cases, but I must allude to the French ships. The "Cecille" and the "Tage" are put down at 19 knots, and 1,000 tons of coal capacity. I do not think the designer of the "Tage" expects her to do 19 knots with 1,000 tons of coal on board. So that Table III, although Admiral Fremantle puts it forward with all reserve, must be taken with that qualification, and if anyone wants to know the truth about the steaming capability of a ship embracing speed and coal endurance, I think a more detailed search would have to be made, and one must not be content with the figures given in Table III. I am exceedingly obliged to Admiral Fremantle for the very kind reference he has made to myself in this paper. It is not an easy position to be undertaking the attainment of speeds which have not been obtained before on ships of a given size, and it does not improve one's comfort in the position he happens to occupy, to have it believed that when the speed is got, it will be spoken of simply as a "paper speed." But we may be sure of this, that the whole of the work of the last few years in the Navy has been in the direction of increasing speed, whatever may be the value of that increase, and that this reconstruction is being, as opportunities offer, carried through every class of ship in the fleet.

Admiral FREMANTLE: I shall not make my remarks in reply longer than necessary. I am very much pleased at the discussion which has taken place, especially as Mr. White has given his very important experience and information. First of all, Admiral Selwyn spoke about the oil fuel, and we know that he holds it in very high estimation. He says that it will provide the ship with double the amount of fuel. That will be a very good thing when we have got it. I have no doubt our naval architects and engineers will not be sorry to introduce it into the Navy if it

can be so introduced, but I have expressed in this theatre before my regret that at present the sources of supply appear to be principally in Russia, or rather in Asiatic Russia.

Admiral SELWYN: Ten years ago, in this theatre, I showed that the source of supply in England was infinite.

Admiral FREMANTLE: If that be the case, I shall be more enthusiastic in its favour. Admiral Selwyn also is rather sceptical as to the speed of our ships.

Admiral SELWYN: Do not take it on my authority; I have not stated it.

Admiral FREMANTLE: Several people have expressed the same scepticism. I am willing to believe that it is that "we do not always see ourselves as others see us," and that other people do not succeed very much better than we do in keeping up speed. At the same time I do think it has been a fair charge against our ships on the measured mile that the trial has been rather excessive. M. E. Weyl certainly appeared to think so; and he, in speaking to the French public and criticizing the English Navy, certainly says that we have got out of our ships by forced draught and by strong measures a speed which we cannot keep up. I particularly avoided the question of forced draught; it was one which I knew would be more or less interesting, but it was quite sufficient for a whole meeting, and therefore I especially avoided it. I may also say I avoided one or two other little questions which have more or less cropped up, such as the question of dirty bottoms and composition for ships' bottoms. I knew that we had authorities here who could have given us a very great deal of information on compositions for ships' bottoms—that they could speak for an hour on the subject—and it would have been extremely interesting. There was also the question of loss of speed in various ways, deep draught, light draught, resistance of masts and sails, and so on. I have alluded to speed as a thing which can be maintained, and that brings me to the great point which I wish to make, and it is a point that I am quite sure will so far have the approval of the Admiralty, namely, the maintenance of speed. We have heard that our ships are to have a four days' full speed trial; that is a very satisfactory improvement, but I think even then it is scarcely enough. I should like to see the whole squadron at a four days' speed trial, and see where all the lame ducks are at the end of the time: you might find one 100 miles and another 200 miles behind. We want to maintain a reasonable amount of speed—I do not say the extreme speed, but a reasonable amount of speed for a reasonable amount of time. That is very vague, I know; I have said 1,000 miles, and I think that is a very fair amount. Now I come to Admiral Colomb, who was good enough to be complimentary about the lecture, and also as to the historical lessons. I lay great stress upon that. I feel quite sure, if we wish to judge of these things reasonably and fairly, we must go to historical sources. We must read them between the lines; we must not take them literally. Of course circumstances have changed to a very great extent, and above all our motive power has completely changed. Admiral Colomb I think went a little too far there. He did not see, as I understood him, that there was any difference. I think there is an essential difference. Unless it be blowing a full gale of wind we can always determine with accuracy that our ships shall be at a certain place at a certain time, and we can say that they shall go a certain number of knots and keep up that number of knots. Now in former days gales, or head winds, or calms made the difference of a week or a fortnight, or more.

Admiral COLOMB: I must have expressed myself very badly, because the certainty of the same speed is one of the points I dwelt on.

Admiral FREMANTLE: Admiral Colomb says he doubts whether the French squadron might be able to escape from Toulon. Now I quite believe it possible, and if it is not so, then the lectures that we have had recently about the difficulties of blockade are certainly not borne out. I myself do hold that blockades will be very much easier than before, instead of being more difficult. I believe, taking the precautions we shall naturally take, some of the germs of which were sketched out by the Americans in their war, we shall see that by having certain interior and exterior lines, and so on, the blockade will not be so extremely difficult as many people have thought; but I am not prepared to go so far as to say that under no circumstances, such as a heavy gale of wind, which would not disturb the vessels in port, but would those outside, a squadron will

not be able to slip out at all. They might not only be able to slip out, but be able to do so haply unobserved, and have a start of perhaps 100 miles. Now the initiative also has been spoken to by Admiral Colomb. I mentioned that the initiative was distinctly found to be with the squadron of faster ships, and I think anybody who may read the reports made last year of the manœuvres which took place between Commodore FitzRoy and Admiral Baird in the Irish Channel will distinctly see that the initiative was all the while with the fastest ships. I do not know whether those papers have been published to the general public or not, but that is so; there is no doubt the initiative was plainly shown in those manœuvres to rest with the faster fleet. Captain Curtis said something about local defence by torpedo-boats. In that I entirely agree. I really think a fleet would not care to go for twelve hours off Liverpool, as I have assumed possible, if they would be likely to be at all attacked when they did get there. With regard to the experience of the stokers that Professor Laughton spoke of, no doubt that is a practical point.

Mr. W. H. WHITE: May I be permitted to add one thing which I had omitted? The report about the injury to the boilers of the "Esmeralda" was entirely without foundation. I quite agree with Professor Laughton's argument, but not with the basis of it.

Admiral FREMANTLE: The question of the ship's bottom is a very important one. Although I did not touch upon it, as I did not think it bore directly on the question, I think perhaps I erred in sticking too closely to my subject. I thought that if I went a little this way and a little that way I might make it perhaps more interesting, but it would have detained you too long. Mr. White speaks of the superiority of English ships; I have already touched upon that point. With reference to the mile trial, I think, indeed I am quite sure, it has been overdone, especially in the running of the torpedo-boats. It was a new light to me when I found out something of these trials. A torpedo-boat came out to Gibraltar when I was there. I was told she went 20 to 21 knots, but I found to my astonishment that I could not get more than 18 out of her. I then began to inquire into this question of fuel supply, and so on, and found that the 20 knots was a perfect farce. It merely meant they came out to the measured mile with just enough coal; I was told they were actually towed there sometimes and ran that measured mile, and had scarcely coal enough to take them home again. That was carrying it to an absurd extreme. I am very glad that Mr. White has criticized Table III, and drawn my attention to what certainly had not occurred to me, so to speak, before. It was a statement as to the number of knots the ships went, and it also gave a statement of what their coal supply was. I took naturally the extreme coal supply and the extreme speed. I ought perhaps to have put two and two together. In some cases two and two have been put together, and in some cases speed—one "two" without the other "two." I am very much obliged to all those who have spoken for the complimentary way in which they have spoken of the paper. I cannot say I am very well satisfied with it. As I said before, you may think I have erred on the side of merely drawing attention to the great advantages which are to be gained by speed; but I do repeat what I said in the paper, which is that the great thing which we have got to learn now is that speed can be attained with almost absolute certainty. To ensure that certainty we must be quite sure that we do not have small craft, engines which cannot run at speed for more than a short time, and we must take care that the big ship engines can also run a considerable period of time, and that both classes can carry a good coal supply. But given that, I think it will change all the factors of naval warfare as they have been hitherto understood. I ought to have answered Admiral Colomb on one point, I think. He challenged me to say whether I thought it was of the same importance to have speed in the battle ships as in the smaller vessels. I do not think it is quite of the same importance. No doubt the cruizer depends more on speed than the battle ship, but I think the tendency has been to go too far in that way. I have seen so plainly the tactical and strategical advantages to be gained by battle-ships in having speed, that I would not like to leave much out in the way of speed under any circumstances. I do not quite understand Mr. White on the question of sacrifice, but I presume what he meant to say was that there was no sacrifice with the naval

architect, on the contrary, he liked to be asked for a great deal, but I think he would ask for a great deal in return.

The CHAIRMAN (Sir E. Fanshawe): I do not think we shall quite agree with Admiral Fremantle on one point, namely, in not being satisfied with his lecture. I think you will all agree with me that the lecture is eminently worthy of a gold medallist of this Institution, and that it will add a very valuable page to our transactions. Admiral Colomb referred to the basis upon which the lecture is grounded, the basis of history. It also struck me, when I read it yesterday, that that was a prominently good feature in the lecture. It is a lecture upon a general element of naval warfare; and such a lecture ought always to be based, as Admiral Colomb says, upon history. But more than that, it struck me that the lecturer has shown a very good example of the way in which history ought to be used; that is, by eliminating carefully all those details which time and circumstances have rendered obsolete or irrelevant, and enforcing only those main principles which are applicable to the present day, and to the altered circumstances of the present mode of warfare. The lecturer, bearing in mind the comprehensive nature of his subject, has avoided all minute details and given us a few general illustrations. I myself, in reading the example he gave of the escape of a fleet from Toulon, did not quite take the same view as Admiral Colomb about its being a fleet going from Toulon, for the purpose of levying a contribution, or doing some injury, at Glasgow. I thought he meant that the Toulon fleet would get to Brest some twenty-eight hours before our Mediterranean squadron could arrive there.

Admiral FREMANTLE: I meant to have said the two French fleets would naturally join together and overwhelm the English fleet, but that the English fleet would naturally attempt to avoid them.

The CHAIRMAN: And I understand that the mention of subsequent operations is a secondary suggestion. The lecture, being on a general subject, most properly avoids details which might introduce cross discussions and lead us from the main points. I am sure I shall carry out all your wishes by most warmly thanking Admiral Fremantle for his lecture.

Friday, February 24, 1888.

THE RIGHT HON. LORD BRASSEY, K.C.B., in the Chair.

THOUGHTS UPON INVASION AND UPON THE MEANS AVAILABLE, OR WHICH MAY BE MADE AVAILABLE AT A FEW WEEKS' NOTICE, FOR SECURING OUR COAST LINE GENERALLY AGAINST SUDDEN ATTACK.

By Colonel SIR CHARLES H. NUGENT, K.C.B.

The CHAIRMAN: Gentlemen, it is not necessary to introduce Sir Charles Nugent to this audience: he is too well known to you to need any introduction. He is known not only by his distinguished service throughout his professional career but also for the excellent work which he has from time to time done in this theatre, which work he is to follow up by the able paper which he will read to you this afternoon, and which work I trust he will never abandon until he sees it satisfactorily accomplished. The essence of Sir Charles Nugent's paper is organization and preparation; but the way to secure organization and preparation is to keep the public who may not be cognizant of all that is necessary to be done in the way of organization and preparation, informed of the things which are neglected. The only way in which that information could be given is through the services of Officers of the authority and experience which belong to Sir Charles Nugent. I can conceive of no service more valuable to the public than that which is rendered by Officers who have had that experience and held those appointments which invest men with authority, and who when they find themselves in command of leisure, continue to give their attention to the work in which they have been engaged, and to assist, as Sir Charles Nugent assists, in a very powerful manner, to form a wholesome public opinion and a sound appreciation of the requirements of the country. I venture rather unusually to say a few words before the lecturer commences, because I shall have to ask him to extend his indulgence to me and to allow me to leave at a comparatively early period of the meeting, as I have an important engagement to fulfil in the country. I have now very much pleasure in introducing Sir Charles Nugent.

IN the armed uncertainty, which is almost worse than war, in which three of the five Great Military Powers of Continental Europe stand, and in which the other two have a painful and almost tangible interest, we in these islands have fortunately no share, yet it would be misleading to assume that we should be able to look on unconcernedly should the present state of expectancy pass into action; the issues of such a war, should war break out, must be fraught with the most far-reaching consequences to Great Britain; it may indeed be of less consequence to this country by whom the Baltic is held, but the keys of the Black Sea cannot be conveniently trusted to Russian hands if British Commerce is to continue upon its present Trade-routes to the East; and so,—as which ever side wins, Turkey, our old

ally, will probably lose,—we, who have no desire to see her weakened, cannot view the prospect of strife with unconcern.

Moreover there is this further danger that the victor may emerge from the strife unexhausted, with a large army which he dare not disband, and which he can with difficulty refrain from using—nay, which may insist upon being used.—Power begets the lust of sway.

What is this to us? some will say. We have no intention of interposing in their quarrels. That may be so, but the man who in a general *mêlée* takes no side, ends by being the enemy of all, and we may end by being in that unenviable position. It is possible that I am indicating a state which may never arrive, but still we *may be in such a position*, and it is well to be prepared for it.

The high-souled moralist, intent only upon the advocacy of peace, and desiring to make his anticipations square with his moral prejudices, may say, that to attack a scrupulously unoffending nation would be the height of immorality, and utterly repugnant to all the principles of international law and international right—the cynic will laugh, and well he may;—if Law be but the expression of the will of preponderating Power, the interpretation of International Law will not, we may be assured, rest with the weaker Power, it will find its true expression in the well-known couplet—

> For those will take who have the power,
> And those must keep who can.

And as for International Right he will say, and say truly, that it is but another term for International Might.

Upon the possessor of unlimited Power, the only restraint is the limit of his inclinations,—in dealing with the past of Europe it has, it seems to me, been the fashion to dwell so much upon the achievements of Napoleon, while his many ill-considered schemes and undoubted failures are deliberately placed out of sight, that he has come to be regarded as a monster of military capacity such as is seldom seen and produced only at very long intervals;—yet in truth—History is pregnant with such examples;—it may with confidence be asserted that *the occasion makes the man;* to the reflecting mind it is astonishing how small is the difference between the leader and the rank and file; the claim of the king of the tinkers to eminence above his followers will after all be found to rest upon an extra smudge upon his nose.

It may well give us pause to speculate upon what may happen at no very distant future,—the victor in the coming strife, *for come it must*, may stand the possessor of unlimited resources, resources which Napoleon never imagined in his wildest dreams,—trained men outnumbering his in the proportion of at least five to one—means of transport by sea and land immeasurably greater, independent of weather, and at least five times as swift;—means of communication so incalculably rapid as to be practically instantaneous; better food in far smaller compass; death-dealing weapons lighter and more mobile, delivering with unerring certainty their blows from tenfold distances with twenty-fold rapidity.

When in the previous history of the world has even a tithe of this

fatal power of death been concentrated in a single hand? Will its possession, think you, make the possessor more moderate? Will there not always be old scores to wipe out? Amongst nations there is no such thing as offering the other cheek to the smiter. What Napoleon projected—and he with inferior means was within an ace of success—the Attila of the future may attempt, and with superior means may succeed in. Why should the one have more scruples than the other? What tempted the former? Our prosperity! It is more tempting now. It is perhaps forty times as great as it was then: The national wealth was estimated in Pitt's time at less then 200,000,000*l.*—it is now considered to be more than 8,000,000,000*l.* 2. Our defenceless state!—are our Defences in better order? Is not our commerce upon which we depend more world wide and far more vulnerable? The food stuffs upon which we live,—do they not come from longer distances and in greater quantities? Then, these islands were self-sustaining—now, with more than twice as many mouths to feed, they only produce food for one half their inhabitants.

But after all, some may say, Napoleon is only an instance,—and an exceptional instance,—of utter want of scruple in the wielder of enormous power. Now this is by no means the case—without leaving the history of our neighbours and present good friends, if we go back some 150 years, we find the Ruler of France, the most powerful potentate at that time in Europe, the Grand Monarque, deliberately and without scruple assailing the most peaceful and most prosperous State in Europe,—incited thereto by its littleness, its wealth and its independence of opinion, for so far as I can see he had no real, certainly no just, ground of quarrel with it; but, bad as his conduct was, that of the King of this country was worse, for, regardless of treaty obligations with the States of Holland, unmindful of family ties, he, the abject, dependent hireling of France, did not only connive at, but did give the British Fleet to assist in, the iniquitous enterprise of the Grand Monarque.

My sympathies are entirely with the States of Holland, in whose people I recognize many and the best qualities which give character to our own race,—their aptitude for the sea, their commercial enterprise, their stubborn independence, their freedom of opinion, their rugged honesty;—yet alas! in them I recognize also other and worse points of resemblance,—their political divisions, their indifferent selfishness, their apathetic neglect of even the most evidently necessary preparations,—and they—*absit omen*,—were near being annihilated,—in twelve days the Country of the Generalities and three Provinces—Guelders, Utrecht, and Overyssel—were in the hands of the French, and the remaining States were only saved by self inundation;—Holland remained submerged for two years.

Interesting as is the history of this Dutch struggle, we might be content to leave it here but for two lessons we should do well to draw from it, one defensive and one offensive. The first is that neglect of due preparation, if it does not lead to irretrievable disaster, entails tenfold eventual cost, and that the States were secure on their sea-

front, they were only vulnerable along their land-front. What in their hour of need would they not have given for the extension of their sea-front, to embrace their whole country? The second is that their strength, their carrying trade, was also their weakness, for with them then, as with us now, their transactions were with every nation, and covered every sea—their carrying trade was at that time twice as large as ours—so they concentrated, and were compelled to concentrate, every effort upon their fleets, not as a *means of defence* so much as a *means of offence.*

Thus De Witt writes to the Commissioner of the United States with the Dutch fleet, "I consider it of the greatest importance to use all means for ravaging the English coast and seizing on the fort of Sheerness, as well as for burning and destroying the English ships which have been hitherto detained in the Thames; our lighter frigates might then sail up the Thames and devastate the country, so as to cause consternation in the Defenceless Capital, and to incite the malcontents in London to rise;" and De Groot, the Dutch Ambassador in Paris, writes, "It is only the Fleet which can make any impression on France," and he proposes to employ the Fleet also against the French Colonies.

Let us pursue a little further the parallel we have been tracing—the States of Holland, abutted on neighbouring countries, over one-half their Frontiers, from which they were distinguished by no natural features, save in one portion by a great river, which is a source of weakness rather than of strength; we are encompassed by a *yet* inviolate sea, which effectually severs us from our neighbours; they, these frontiers passed, and their enemies' legions within their Territory, could give back to the envious waters the soil which they had recovered from the sea by their stubborn energy, and which they maintained by their unceasing labour; we, our friendly waters passed, cannot call in the timely aid of Nature, we must depend on our own right hands; they, unwisely indifferent to the necessity of preparation, were still a homogeneous people, with ardent feelings of patriotism;—we more unwisely, because contemptuously, indifferent to the necessity of preparation, are very cosmopolitan, with a large and influential, because wealthy, class, only English, and caring for England, so long as they thrive and are well being. These—how far can we depend upon these?—sorely tempted by the blast of adversity, may be an occasion of trouble, and must be a source of anxiety.

The lessons to be learnt, then, are the necessity, the supreme necessity, for *organization* and *preparation*,—and I ask of myself the questions:—In the event of our being invaded,—have we an organization upon which we can rely? What is our state of preparation? In short, are we prepared at all? But when I take up my pen to answer these questions, it occurs to me that it was without sufficient consideration that I accepted the invitation of the Council of this Institution to invite attention to-day to the measures "To secure our Coast Line generally against *sudden* attack with the means of defence at present available, or which may be made available, at a few weeks' notice."

I scarcely anticipated that the task would prove so uncongenial as it has; in the few weeks which have elapsed since the Council's invitation, I have turned it over in my mind anxiously—again and again,—most anxiously—and the more I turn it over the less I like it.

If I am compelled to answer directly the question what measures are to be taken in a short time (*sudden* is the Council's word) to place our Coast Line generally in a state of security, I must in honesty reply, "It cannot be placed in a state of security in a short time."

Must we then do nothing? Must we sit down with our hands folded, and contemplate our state of unpreparedness? By no means: we can do nothing suddenly,—we can do but little in a few weeks, still we can do something, and we should do what we can; but that little cannot be made to cover the Coast Line generally.

The Defence of the Coast line should be *amphibious*, that is, partly on the land and partly on the water. On the Land, certain Places call for such permanent Defences as shall ensure to them absolute security;—in this class are the Great Military Ports and Arsenals. Next, secondary places which call for such defences as shall render them secure from predatory assault, and enable them to hold out for a considerable time if attacked in force,—of this class are the lesser Military Positions and the Great Commercial Ports,—lastly, all other places on the Coast which should be denied to an enemy, in fact to the remainder of the Coast generally;—it is this third class with which we are at present concerned.

I may here remark that even with ample time and means at disposal it would be, I will not say impossible, but inexpedient to attempt to defend the whole Coast line. Most certainly it would be inexpedient wherever the water is deep inshore; the conditions of offensive naval warfare have so altered that Defensive works of ordinary construction cannot be resorted to unless in exceptionally advantageous positions; works of light profile on low shores, such shores as are favourable for the landing of troops, will seldom be able to stand against the heavy guns which covering squadrons will in future carry. The most favourable positions for such Defensive works must, if not protected by Ditches, be so far inland as to be out of reach of the guns of attacking ships, but in positions whence they can play upon the place of landing or harass the Invader, and cause him to spend time after he has landed in throwing up works of Defence to protect his Base.

The disposition of Towers and Batteries, as you may see them along the South and East Coasts, will never be resorted to again. This would not, however, preclude use of them wherever they may now be found.

Submarine mines must have the protection of guns, either in Gunboats and Coast Defence vessels, or in batteries ashore, and so likewise as a general rule must Torpedo-boats; this is especially true of locomotive Torpedoes, that is, Torpedoes controlled and operated from the shore; the places of operation must have gun protection and concealment.

No doubt submarine mines may be improvised and provided locally, and so, perhaps, may be provided means for making use of Whitehead Torpedoes, if there be sufficient store of these in the Kingdom for the supply of localities; but locomotive Torpedoes cannot be used with success in such amateur, or rather Volunteer, fashion.

Speaking generally, then, the points of the shore which require Defensive attention will be few, and will be limited to the Termini of main and direct Lines of Railway to the Capital, or to points which may offer themselves as favourable to break the Front of Invasion; the objects being to delay the enemy as long as possible, and so give time to break up the Railways, and to remove the Rolling Stock, to carry away cattle and provender—and for strengthening the fighting positions in rear.

It is evident then that little can be done upon the spur of the moment for the Coast line, and undefended Towns standing boldly on the edge of accessible Coasts must be left to themselves. By local exertion they may perhaps preserve themselves from single cruizers, but that would seem to be the most they can expect.

In such local effort the services of their seafaring populations can be turned to good account. It is a matter of wonder to me why no solid attempt has been made to recall to existence the Sea Fencibles, which in 1805 mustered 25,000 men. We have 135,000 Fishermen, who know the water and who know the land; a good organization, and a short annual training, which need not entail great cost, would enable them to render most valuable service, and would afford employment to many retired Officers, full of energy and experience, who are now eating their hearts away in enforced idleness.

On the water the Defence of the Coast line would be with the Coast Defence vessels, Gun and Torpedo-boats, and Auxiliary Cruizers. No addition can be made to the Coast Defence vessels in a few weeks, nor can Gun and Torpedo-boats, except for local Service, be improvised in material numbers, but a considerable number of fast Auxiliary Cruizers may be obtained, and they can do efficient service in patrolling our own shores and watching the enemy's coast.

The Positions on the Coast which it is intended to defend, and they should be as few as possible, should be marked out, the local forces, Militia and Volunteers, should be directed to assemble on them, first to form the Defences of the Positions, and then to defend them—the arrangements should embrace the Establishment of Telegraphic Communication with the Centre,—the destruction of Railroads,—Bridges and Tunnels,[1]—the removal of Rolling Stock; the removal of Cattle, Munitions and Stores of all kinds;—and the withdrawal as far as possible of the inhabitants;—all this would of course be done in concert with the Naval Authorities, who would have their attention drawn to the Positions chosen for Defence,—would arrange for watching the Enemy's Ports with fast vessels carrying their own

[1] This is so obvious as scarcely to need allusion, yet we know that in the Franco-German War the French did utterly neglect these precautions.

electric communication with the Admiralty,—for patrolling our own shores;—for the removal at the proper time of buoys and lights, and would enrol a Sea Militia for local Amphibious Service, parcelling the kingdom into districts which ought to be coterminous with the Military Districts.

All this seems simple enough on paper, and indeed with any organization other than that which has obtained in this country might be readily carried out. What we need is *a War Minister* directing the Military Policy of the Nation, with professional Experts under him, *one* administering the Army, and *one*,—*not a Board*,—administering the Navy,—and that War Minister should be an expert, it matters little whether a Military or Naval Expert, so long as he is an Expert.

What would be the object of Invasion? London.

Now we are not likely to be invaded so long as our Fleet is in the way; but our Fleet may be either destroyed,—defeated, and driven off to shelter and refit,—or decoyed away.

We need not discuss the first of these alternatives, we should be in an uncommonly bad way if it were destroyed. I suppose more than one Continental Nation could devote several hundred thousand fighting men to the purposes of invasion, and all that would be left to us would be to fight it out as best we could.

I do not here attempt to forecast the result.

The second and third alternatives differ for the purposes of our discussion only so far as the one leaves more time (though both are limited) than the other at the invader's disposal, but this much we may say, that our Fleet is at least as likely to injure an enemy as to suffer injury, and ought, especially with casual reinforcements from abroad, to be more quickly able to try conclusions a second time; and that the deception which sufficed for the decoying away of the Fleet should not remain long undiscovered.

The Fleet then being out of the way, what have we for defence of our shores? On the water we have, 6 Coast Defence Vessels, 9 Gun Vessels, 49 Gunboats, and 55 Torpedo-boats.

On the Land, we have the Great Arsenals and Military Ports defended (?)—I shall have something to say of these later on;—we have also a certain amount of defence for the Great Commercial Ports, though in some of these the main Element of the Naval portion of the defence is in the District Ships, which belong to the First Reserve and will, I presume, be called away to augment the Channel Fleet as soon as war is declared: of these Defences too I shall have something to say farther on, but it may suffice to say here that in most of these Commercial Ports the Defences can be fairly strengthened in moderate time,—so strengthened at least as to place them beyond the reach of a Paul Jones.

It may be sufficient for our present purpose, anyhow it will be sufficient for the time at our disposal this afternoon, if I deal only with the Coast from Portsmouth to the Forth, because the Coast on the South and East lies nearest to the Continent, and because beyond these points the distance of the Coast from London is so great that

an enemy would be less likely to make for it with a view to a *sudden dash on London.*

On these Coasts, in addition to the Military Port of Portsmouth we have, carefully fortified Positions at Dover, Sheerness, and the Thames; Secondary positions at Newhaven, Harwich;—and less important positions at Littlehampton, the Tyne, the Forth, and the Humber; these latter three coming under the category of the Principal Commercial Ports defended or *to be* defended, though the defences of the latter are poor and not properly developed,—however, local exertion and local resources well directed might do much, if time allowed, for all three; then we have at various points Towers, mounting generally one gun, some few with ditches, and placed a little inland, but most on the shore, with here and there Batteries or Redoubts mounting in older times a considerable number of guns, not mounting, not indeed modified to mount, modern guns, and certainly not capable of resisting modern artillery. You may notice them about Eastbourne and beyond Hastings; and forming what *was* a very complete defence from Dymchurch by Hythe and Shorncliffe to Folkestone, and so on to Dover,—and—which might still, with some labour and rearmament, and making its proper use of the Military Canal, form a position strong enough to deter an enemy and throw him elsewhere.

In many places, however, the Batteries and Towers have decayed away, partly destroyed by the action of the sea, and partly in consequence of the supineness of the authorities.

On the South Coast in the 136 miles from Selsea Bill to Margate are 42 miles of cliff and 6 miles of mudflats, the remaining 88 miles are accessible everywhere and generally unguarded,—making a liberal allowance for the Defences mentioned above there are at least 60 miles absolutely defenceless; the water is open and the 3 fathom line is for most of the extent about half a mile from the shore; moreover, this coast is well known to our neighbours opposite whose fishermen and boats habitually frequent it.

On the East Coast from the Maplin Sands to Yarmouth, a length of 90 miles, the protection is limited, with the exception of at the Harbour of Harwich, to a few obsolete Towers and low Batteries;—on this coast there is scarcely any cliff: and banks lie off the shore at a moderate distance from it, and fairly parallel to it with a general depth inside them of 16 feet at low water.

Between Selsea Bill and Yarmouth there are 140 miles of undefended shore.

From Yarmouth to the Wash, 80 miles, there are no defensive works; while from the Wash northward to the Firth of Forth, upwards of 300 miles, there are Works to hold the Humber below Hull, which has also the protection of an armoured Battleship of the 2nd Class and two Coast Defence Gunboats.—Batteries, such as they are, at Hartlepool and Sunderland;[1]—and Works of some development to secure the Mouth of the Tyne.[2]

[1] Tees has a division of Volunteer Submarine Miners 57 strong.
[2] It has a division of Volunteer Submarine Miners 114 strong.

The Forth[1] is defensible so long as it retains in its waters the Armoured Battleship, the Gunvessel and Gunboat which are at present there; but this Battleship, as the Battleship in the Humber, belongs to the 1st Reserve, and will, I suppose, be called away at the outbreak of war to augment the Channel Fleet, or until the larger Battleships of the 2nd Reserve are ready for sea.

London being an enemy's object, and these shores being for the most part undefended, what have we to stop an enemy between the South Coast and London? Between the South Coast and London there are no works except in front of Chatham, but upon the land we have 71,810 Regulars of all ranks, if from these, however, be deducted the non-combatants, the Depôt R. Artillery and R.E.'s under instruction, the available total for service in England is not more than 66,000 of all ranks; of these 42,000 at present are in the different garrisons, such as Portsmouth, Plymouth, Dover, Chatham, and as even with the services of the adjacent Militia and Volunteers these garrisons will still be not too fully manned, so that none can be spared, the total of all ranks falls to 24,000. What proportion of these are recruits either untrained or partially trained?—I have no means of ascertaining, but the proportion must be considerable, not less I should think than one-fourth; and a fourth which could not be made soldiers in a few weeks.

We have, however, the Army Reserve numbering 51,000, and the Second Class Reserve numbering 5,000, in all 56,000. I assume all of these would muster to their standards Territorially, and that 31,000[2] would be available, so that the Field Army would amount to 55,000, and to this should be added such Militia and Volunteers as might at once be drawn to it wherever it took up position for delivering battle. Supposing such position to be in the neighbourhood of London then the Militia to be mustered to it would be from London, Middlesex, and Surrey, and would be 5,228 line and 168 cavalry, and the Volunteers should be 31,314 line, 2,617 Artillery, 2,250 Engineers, all told; but these Volunteers have no organization as a fighting body, and lack transport, field equipment, great coats and guns, so that if they all responded to the summons they could not for some weeks be put into the field as a manœuvring body, and even then should be brigaded only in small numbers with regular troops, so that 15,000 are as many as should be counted on for some weeks.

Since writing this, in the "Standard" of 2nd February is a notice to the effect that "the Volunteers have been assigned a definite place in mobilization, that no effort has been spared to *assist them* to *become*," not to make them, "efficient,"—that nearly "50,000 have been provided with great coats," and that "the experiment of

[1] It has a division of Volunteer Submarine Miners 63 strong, and Fife Artillery 945 strong, and Midlothian Artillery 579 strong.

[2] The Reserve to be mustered to it would be at first the Cavalry, Artillery, Engineers, and Guards, and the Line from the Counties round London, and then as time went on from the other Midland Counties, in all perhaps 31,000 men.

Volunteer Transport has been tried with such marked success, that it was *now intended to extend it*"—*now*, after thirty years' existence—"eighty guns have been *allotted*," it did not say *issued*, to certain inland Volunteer Corps,—not however assigned for the defence of our Coasts; and that some Counties were registering horses and wagons in view of "the Volunteers being able to take the field immediately on mobilization without reference to the War Office;" submarine Mining Corps were being sanctioned for the defence of our principal Commercial Ports,—the expenditure of 110,000*l.* for the Brennan Torpedo could only be justified by our *at once proceeding to place our Coasts in a state of Defence*,"—and it added that during the present Government's short period of office, our Home Army was being systematically equipped for National Defence. Well, gentlemen, I can only say I am heartily glad of it, and shall be still more glad when the result bears out the boast; I have heard of these schemes, with the exception of the registration of horses, off and on for the last fifteen years, and as to the Mobilization Scheme, for having gone a long way to carry out which credit is taken, it has been on paper since 1876.

Then it goes on to say that the money voted for our Coaling Stations Abroad would enable us to mount the guns, and to complete several Stations in the present year. I mention this in order to apply a test to this one of the remarks, and so to gauge the value of the rest: this test is an utterance of Lord Brassey at the London Chamber of Commerce. Lord Brassey said—I am speaking from recollection and so am open to correction—at Simon's Bay, Cape of Good Hope, the Works, Imperial Works mind you, not Colonial, are completed, but not having Breech-loading Guns ready, they were going to place in the emplacements, as a temporary measure, muzzle-loading guns. Now muzzle-loading guns, I may tell you, will not work in breech-loading gun emplacements without they are altered; a temporary measure, forsooth, once in the emplacements, will they be removed? I fear they will verify Lord Palmerston's saying, that nothing is so permanent as a temporary appointment,—not improbably our grand-children, visiting the Cape on pleasure or on business, will see this astounding, this everlasting memento, of our foresight.

Experience of the War Office teaches me that there is a struggle for mastery, which has become chronic, always going on between the military and civil elements;—at one time one prevails, at another the other. Whichever gains the upper hand the taxpayer in the long run suffers. Under present arrangements the military element appears to have become supreme.

Subsequently, to show how thoroughly in earnest the War Office was, it was mentioned that the age of retirement for Captains and Majors was raised,—that 75,000*l.* had been saved in various small contractions, which as likely as not may all expand again with the next change of Government; the utterance wound up with the astounding statement that it was proposed to promote at all hazards the efficiency of the Army, and to meet the increasing demands of our Empire,—how?—by a *reduction of individual items of expenditure.*

Contrast this with the action of a neighbouring nation, fortunately our very good friend, which with an army of 1,500,000 men voluntarily incurs an expenditure of 14,000,000*l.* for 700,000 additional men, and which has in the last year raised, on Loan also,—for extraordinary Military Expenditure 44,700,000*l.*, viz., 35,500,000*l.* for the Army, and 9,200,000*l.* for the Navy,—and had besides spent from the French war indemnity 33,500,000*l.*, while we in the last six years have provided, after in vain trying to shirk finding the money, 378,800*l.* (about the sixth of the amount recommended by the Royal Commission), for what may prove matter of life or death to us,—I refer to the Defences of our Coaling Stations Abroad,—and of which we seem only to have succeeded in spending 178,000*l.*

The same remarks as to lack of organization apply, though in a less degree, to the Militia,—and it is not probable that all told we should have a larger field force to cover London than 75,000 men, of whom about two-fifths would be raw soldiers.

I assume that the Militia and Volunteers of the Counties between London and the sea would be arrayed in their Counties, at any rate for the first moments of invasion, and that they would be drawn away, in part at least, to supplement the garrisons of Chatham, Sheerness, and Dover; they might perhaps release a few regulars when once the direction of the invader's march was committed; however, they are in reality very few, viz.:—

	Militia.	Volunteers.	Total.
Kent.....	3,580	6,940	10,520
Sussex	1,752	1,062	2,814
Essex	1,696	3,579	5,275
			18,609

of whom not more probably than one-half would be efficient.

What would these 75,000 men have to meet?

That depends upon many circumstances, and chiefly whether the invasion was undertaken by one nation (perhaps not very likely), or by two nations, as in the case of the invasion of Holland by Louis XIV of France, and Charles II of England; but we may feel sure that it would be more than twice 75,000 men, picked soldiers, and commanded and handled by Generals skilled in handling large bodies of troops.

Napoleon I allotted 132,000 men for the Army of England, which he afterwards increased to 178,000; and in 1870 Germany had placed 300,000 men west of the Rhine (a distance of 500 miles), in fifteen days, after the declaration of war; and within six weeks had arrayed 780,000 men in France.

These 75,000 men would have to meet then twice as many, or to be within the mark let us say half as many more picked fighting men, well found in every respect; and to enable them to meet this stronger force with reasonable prospect of success they should meet them in well-prepared positions. Who is to prepare these positions? Our Volunteers and

Militia have had no practice, and even digging and shovelling require practice, and the Line with the exception of a few Regiments are of no use in such work. It is a standing reproach to us, that we who produce the best, the only, navvies in the world, cannot produce soldiers who can dig and shovel. Our rulers do not in their hearts appreciate the true value of this, yet in the American War of Independence, American Generals made full use of this; and so in the Franco-German War did one French Corps, but then it was commanded by an Engineer, and it was the most successful in the field. Has any one such position been thrown up? Nay! Has any one ever been marked out? and where are the guns for it? Even if any of these positions have been thrown up,—throwing up alone is not sufficient, they should be occupied by their defenders, and the defence of the positions rehearsed. Similar measures should be taken at or near the sea coast; this is very important as the enemy is most assailable at the moment of landing. Have such measures been taken? and if they have, how are the positions to be manned? Will your 75,000 available men,—and you will have no reserve of real soldiers,—be so mobile that they can occupy to the last any such positions on the coast, and fall back in good order to the fighting positions in advance of London? And in falling back will they be able to hold the enemy in check sufficiently long to give time for making these positions defensible? Let us hope that these 75,000 men will be so mobile, for a good deal will depend upon these men,—these men with no reserve. Yes! a good deal,—more than some of us imagine. Let us hope—ah! yes, we have lived a long time, —and so may continue to live—in hope.

But what if we should be invaded upon two sides of London? There is much to recommend the North side to an Invader, and I confess I have a predilection for the North and East. No doubt the North side is farther from the sea, but it is not so very far after all, and the East shoreline is accessible and practically undefended. The country in advance of London is less favourable for defence; upon this side (including the East) and therefore open to an invading Force is the Powder Establishment at Purfleet, the Powder Factories at Waltham, the Small Arms Factory at Enfield, and ought I not to say the Arsenal at Woolwich; moreover a hostile army on the North side interposes between London and the great manufacturing towns in the Midlands and beyond,—cuts off the great Port of Liverpool with its vast stores of grain, only second in importance to London,—cuts off Elswick Arsenal, and holds at its mercy the produce of all the centre of England; and if the available fighting Force is occupied on the South has nothing to oppose it,—or rather has only 7,844 Militia, 11,676 Volunteers and 168 Yeomanry Cavalry.

Moreover it cuts off from the South 5 Regiments of Cheshire Volunteers, 2 Engineer Corps, 8 Corps of Lancashire Artillery, and 22 Regiments of Lancashire Volunteers, thus paralysing 23,534 Line, 5,658 Artillery, and 1,094 Engineers.

Let us see what there are to oppose it. In the Coast Counties, in

	Militia.	Yeomanry.	Volunteers.	Total.
Essex.....	1,696	—	3,579	5,275
Suffolk	2,176	168	—	2,344
Norfolk.....	2,272	—	2,926	5,198
				12,817

Or 1,928[1] Artillery, 5,088 Militia, 168 Yeomanry, 5,633 Volunteers.

Around north side of London—

	Militia.	Yeomanry.	Volunteers.	Total.
Hertford	—	—	1,278	1,278
Bedford	1,696	—	914[2]	2,610
Buckingham...	—	336	1,098	1,434
Oxford.....	1,696	—	1,186	2,882
Cambridge	—	—	1,463	1,463
Huntingdon....	—	—	—	—
Northampton ..	1,272	—	1,100	2,372
Warwick.....	1,696	336	2,200	4,232
Leicester	636	—	1,100	1,736
				18,007

Or 6,996 Militia, 672 Yeomanry, 10,339 Volunteers.

And farther, if this invasion with the North side of London as its object, should comprise a force specially organized to seize on the Crouch and the Blackwater; and this need not be a strong force, 25,000 men or even less would suffice, for the position between these two rivers from Fambridge to Cold Norton is strong, and easily held at its inner extremity, where it is about 3 miles wide,—moreover, it is only 35 miles from London. The Camp at Colchester would be turned,[3] and the 12,649 Militia and Volunteers of the three Coast Counties thrown away from the Capital; then too Purfleet, with its Powder Establishment, would be at their mercy.

On this side too then positions would have to be marked out and manned;—but where are the men? and where are the Position Guns? Upon this side it is no question of a *mobile Force;* it is a question of men. Men—after all the first and most important requisite of an Army: and we have seen what is our available supply of trained men.

No doubt we could improvise submarine mines at short notice and in large quantities, but submarine mines are useless without submarine miners, and without guns and boats to protect them. We have seen that the Naval Force available is 6 Coast Defence Vessels, 64 Gunboats of sorts, and 56 Torpedo-boats, supposing we employ

[1] Of these 872 are Volunteers.
[2] Of these 91 are Engineers.
[3] This Camp should be intrenched.

here, in our own waters, this all our available Force, but no doubt at least half would be required for Foreign Waters, and there are 300 miles of coast line between Selsea Bill and the Wash to be protected; 1 Coast Defence Vessel and 5 Gunboats per 50 miles of coast, with only three places in which they can take shelter, viz., Dover, Harwich, and the Thames.

But these Coast Defence ships and boats are for the protection of the whole of the Coast line of the United Kingdom—a line of 3,000 miles; how many, think you, can be spared for this 300 miles?

With regard to this Coast Defence Flotilla very hazy notions seem to prevail. Most of those to whom I have spoken on the subject have fallen back on vague generalities, such as Torpedo-boats and Gunboats, and Submarine Mines are just the things for the Coast; they are most valuable, but when pressed, they do not seem to have clear ideas of how they are to be used. Of course neither Gunboats nor Torpedo-boats can be employed alone; they must have supporting vessels, and one Coast Defence Vessel and its proportion, whatever it may be, of Gun- and Torpedo-boats if useful against one or two or even more hostile vessels, must retire before the covering Fleet of an Invading Force. And I suspect that the *rôle* of these craft will be our Coast Defence Vessel with its proportion of Gun- and Torpedo-boats to a Commercial Harbour, where it will lie snug. However, it will serve my purpose if I hereby elicit an authoritative statement from some naval Officer present.

You will have noticed that I have said nothing of our great Military Ports, assuming perhaps that they at least are armed, and like the strong man possess themselves in peace;—but this is not so. I believe I am correct in saying that the approved armament of breech-loading guns is not in them, and that upon the seaside some of our most costly Forts are absolutely *unable at this moment to fight an action*. Yet the Forts have been completed, with the exception of their armament, for seven years, and on the land side—well you can walk round the land fronts and see for yourselves, as I daresay every Foreign Military Attaché has done over and over again.

And of the Garrisons? I have assumed that their present strength of Regulars must be maintained in them; but I will go farther, and will say, take any Port you will, I care not which, that the present strength in it is not at this moment sufficient for the nucleus of a garrison of Militia and Volunteers, and moreover that it cannot be for some time. My impression is that the Secretary of State for War has stated that these great Military Ports will be garrisoned by Militia and Volunteers. You may place these Auxiliary Troops in them, but the Ports will not then be garrisoned: the service of heavy siege artillery requires most highly trained artillerymen, and not only highly trained but with a considerable amount of *local* training and experience which cannot be acquired in a day. Has a drill been devised, say, for the Spithead Forts? My firm belief is that if you beat to quarters at this moment you could not open fire over the whole seafront of Portsmouth; I doubt if you could in six days—I

was nearly writing six weeks. One thing too is pretty certain: no one would know with whom the supreme command vested, Admiral or General.

If we turn to those Commercial Ports which are *defended* (?) what do we find? A Committee which reported on them some time ago recommended a mixed defence on land and on the water, the latter I believe served by local matériel and manned by local men, and submarine miners have been raised in some ports, and arrangements for the provision of boats locally made. So far so good. But who will conduct the defence? Are the arrangements for the conduct of it made? Will they be under the General of the District or under the naval Officer in charge of the particular portion of the Coast? Let us hope that there will be no friction between these two potentates. The recommendation of the Committee for these Commercial Ports must have, I should think, amounted to a couple of millions, but I have looked, and in vain, through the Estimates for any expenditure upon them.

In the event of any Invasion, but especially of an Invasion such as we have had under consideration, viz., upon the South and East Coasts, the absence of an Enclosed Military Harbour or Naval Intrenched Camp, at Dover, would be severely felt: a comparatively small fleet sheltering under the guns of Dover in such a Harbour would be able to operate to the North or the West as occasion offered, and would have its offensive strength doubled; here, too, would be a post of vantage and security for Coast Defence Vessels and Gun Boats.

What is to be said of the infatuation and imbecility of successive Governments? The Harbour—No, not the Harbour,—the completion of it—has been recommended by Parliamentary Committees; urged as a Military necessity by the Military Authorities; demanded by the voice of our Seamen; taken up in apparent earnestness; lightly thrown aside; handed over to the Convict Department to be constructed by Prisoners; in erecting a Prison, for whom as a preliminary measure a considerable sum has been spent;—spent, and for what purpose?—I see nothing in the Estimates of this year for Dover Harbour; and the one arm constructed 10 years ago at a cost of 970,000*l.* exposes itself unblushingly as a Governmental abortion, over which rival Railway Companies and Harbour Boards may have an opportunity of squabbling.

All, and more than all, the military advantages claimed for a Harbour at Dover may be claimed for a Military Refuge Harbour on the East Coast—place it where you will—I care not, so long as it is central—Filey, Redcar, or elsewhere. I, however, prefer Filey. Respecting a Harbour on this Coast, Commissions and Committees have sat and taken evidence, and have issued reams of matter. Thirty years has this matter been bandied backwards and forwards, and the Harbour *is not*—yet if we were invaded on the East Coast—a well-protected Harbour at Filey would be of enormous value to our Fleet, as well as to our mercantile and fishing marine, and upon fish we depend for a considerable portion of our daily food.

We, with our small Army which we cannot increase, should spare no expenditure which will afford facilities for using it more effectively, which will save it and render it more efficient, this saving of men is a great matter. Our men are not only fewer, they are twofold more expensive than the soldiers of other nations, and we must be strictly economical of them; *we cannot afford to throw away a man.*

On the water, we should collect all the fastest Auxiliary Cruizers, and dispose them to watch the enemy's Ports, and to patrol, in pairs, the whole of our Coast Line, maintaining the while Telegraphic Communication with London and with our Fleets;—we should improvise, making use of obsolete or non-seagoing ironclads, Stationary Defence Vessels for our principal Military Ports and defended Commercial Ports, thereby freeing our Coast Defence Vessels, and enabling them to act together;—we should add to our Torpedo and Gun-Boat Flotilla by the impressment of all boats capable of being converted temporarily for this service (in 1805 we had a flotilla of 660 such boats); we should take steps for removing at the proper time the buoys and lights at the entrance of the Thames and elsewhere, and make ample provision for the defence of the Thames and Medway:—I think there should be a special Thames Flotilla. Many boats, both Gun and Torpedo, will be found in the boat yards of the Thames and should be at once appropriated. Stores of Submarine Mines and Torpedoes should be collected to the smaller Ports which it is intended to defend, and local boats and men should be enrolled, and practised in the Defence they will have to maintain, assigning Rallying Posts to the men who should be parcelled out under Naval Command throughout the Kingdom, the centre of each Naval parcel coinciding with the Military Centre;—lastly, all Districts should be placed in Telegraphic Communication, and the lines of retirement indicated.

On the Land, the Military Ports should be armed and fully equipped, the Submarine Defences prepared and in readiness, and the garrisons made up to their full strength, the due proportion of Regular Troops being maintained.

All questions of command should be definitely settled. The Land fronts should be placed in fighting order, fully equipped and garrisoned, but to them a large proportion of Militia and Volunteers should be allotted, ample use being made of the Artillery Corps of both Services; intermediate fighting positions should be marked out, and the country in advance cleared as may be necessary.

The Commercial Ports should be treated in like manner, but as they will need considerable land defence of a more temporary nature, such defences should be marked out and thrown up by local means, the local Militia and Volunteers being made use of for this purpose;—the Submarine Defence must be practised and the stores for it collected.

Arrangements should be made to enable the Naval and Military Authorities to act in concert;—a clear understanding in this respect is most necessary.

On the Coast Line generally, the points which it is most important to hold possession of should be selected,—all other places should be

rigorously excluded, and this should be made known to them,—the points selected should be few, and such Defensive Works as time allows thrown up for their protection, local Forces being employed as much as possible.

Arrangements should be made for removing rolling stock, cattle, provender, vehicles, and stores,—for breaking up roads, rail and macadamised,—for destroying bridges and tunnels;—the Yeomanry should be called out for scouting purposes, and the General Arrangements indicated to all concerned, Naval as well as Military, so that all may fall into their proper places at the first alarm and without reference to Headquarters.

Fighting Positions in advance of London should be carefully selected, and the Defenders mustered to them; in preparing these navvies should be extensively employed, and the camps at Aldershot, Colchester, and Shorncliffe should be intrenched.

All Foreigners who are not naturalized should be compelled to quit the Kingdom.

To sum up—What have we upon which we can rely when the Storm of Invasion falls on us? Have we men? The men might be sufficient,—if the Regulars were mature soldiers, but this they never can be under present conditions, and as long as the force in England is the feeder of an equal force in India,—if the Auxiliary Forces were efficient and complete in Equipment and Transport,—if our Field Artillery were more numerous, and we had ample provision of Stores and Tools,—if our Garrison Artillery and our Position Artillery were in their places, and manned by trained artillerymen: and if our Great Military Ports were fully manned, armed, and munitioned, and our Principal Commercial Ports were fully defended;—and if ample allowance were made for waste of men, horses and *matériel*.

If we turn to the Navy—Have we Battle Ships sufficient? Some Naval Officer will perhaps say:—Have we cruizers enough? I think I may answer we have not. Have we Coast Defence Vessels, Gun Boats and Torpedo Boats enough? I have no hesitation in answering,—We have not half enough;—in calculating these very liberal provision must be made for the Defence of the Thames. Have we men enough? Again I say we have not; I am aware that there is difference of opinion here, but I take Admiral Ryder's view, and think arrangements similar to those which prevail in the French Service should be devised for passing annually a certain number of men of the Mercantile Marine, through the Royal Marine. Some say that the number of seamen enrolled is sufficient to man all our ships including both the reserves. My calculations do not bear this out,—but at any rate I feel sure that if I am wrong the number of Seamen in Her Majesty's Navy does not make a sufficient provision for waste, and I would increase the Naval Reserve, and raise a Sea Militia to be employed locally. Local effort should be encouraged everywhere.

Shall we ever have these things, which we have not, and which we ought to have?—Never, so long as our organization is what it is. The self-put questions with which I started need no replies from me.

Have we an organization upon which we can rely?—You, who have heard me, can answer each for himself. What is our state of preparation?—You, who have heard me, know. I recollect General Collinson, who had given much time to this matter of invasion, quoting in this theatre a maxim of that wise old soldier, Sir Henry Harness, that "the War Minister of the day should be the Strategist of the Empire, and that the units he deals with should be fleets and armies." Has any one here present ever seen such a War Minister? I have never got beyond dreaming of such a War Minister. I have dreamt of a military Utopia where the Secretary of State for War and First Lord of the Admiralty were rolled into one. I assure you that together they did not make a very large person. When one General and one Admiral administered the Army and Navy respectively, when in the Army, all branches of the Service were paid alike, by which half the Army Circulars at once died; when merit ruled promotion, when education and examination were less priggish and more practical, when education indeed was considered as a means, and not as an end; when decentralization and liberty of local action prevailed, when to the Civil Subordinates were remitted all questions of buttons and straps and buckles, and when each man knew his work, did it, and was content to do it without interfering with his neighbour; when, in short, the Military Lion lay down with the Civil War Office Lamb.

When in the Navy the administration was not by a number of co-equal and co-ordinate Lords; when one official did not, as I have seen stated in the daily papers, draw a high salary for doing nothing, while other officials drew low salaries for doing everything. When the Marine Artillery were put to the duty for which they were educated, that is, the handling of guns; when,—but I am not familiar with naval matters, and I was so startled by the other things of which I dreamt, that I turned uneasily, and turning, woke. I dreamt this last night, and to-day,—well to-day is as yesterday. It is too late for much reform to-day, but to-morrow, yes,—we may do something to-morrow; how much we do must depend upon you, and those you influence.

The CHAIRMAN: Gentlemen, I stated in my opening remarks that unfortunately I should be unable to remain for the discussion. I am glad to be able to say that Admiral Boys has kindly undertaken to fill the chair. Before I leave I must express my own personal obligations to the gallant Officer who has read this paper to us. No doubt in the official world that word "mañana" is not altogether unknown, and a great many things are put off until to-morrow which ought to be done to-day. If you want to remedy that, to obtain more prompt action, as I have already said, what you require is that some Officer competent in these matters—not a single Officer but many Officers competent in these matters—shall undertake, as Sir Charles Nugent has undertaken in this and in other papers and will undertake in future papers which I trust he will read, to keep "the man in the street" informed of the state of affairs. I cannot say, long as was the list of deficiencies which Sir Charles Nugent read to us, that there was any single one of them to which as a layman I could take exception, and no doubt the enumeration is melancholy enough. I should not like to say a word which would tend to convey the impression that I was in favour of that policy of "mañana": I wish that all that Sir Charles Nugent has told us of should be promptly and efficiently provided, at the same time, speaking at any rate for the naval service, I think we are moving rather faster than we were. The public opinion of the country was aroused by the

representations which were made through the usual public channels. Largely increased sums have been placed at the disposal of the naval authorities, and certainly we are building much more rapidly than before. I trust we are building vessels which will prove efficient. With regard to the manning of the Navy we are certainly in advance of the position as it was a generation ago. We have organized a naval reserve. I hope that force is a valuable force; I should like to see it largely increased in numbers, and I think with more care, more attention, involving of course some additional expenditure, the efficiency of the naval reserve, which I trust is already not altogether unsatisfactory, might be increased. If that were so, some of the deficiencies which Sir Charles Nugent has pointed out in the manning of the Navy would be provided for. Then when we come to the question of the manning of the Coast Defence Flotilla, we have made a step—a small step, but we have made a step—in the organization of the Royal Naval Artillery Volunteers, and that force has certainly been put upon a far more satisfactory footing by the action taken by the present Government in recognizing it as having an equal claim with the volunteers of the military branch to the receipt of a capitation grant. With that capitation grant and more facilities for instruction, I hope that the efficiency of the Naval Artillery Volunteers will grow as the efficiency of the land service volunteers has greatly advanced in the last few years. These are points which I wish to urge not with the view of mitigating the anxiety of the country—I do not wish that—but to show that we are making some progress, and if we are making some progress, depend upon it we owe it to the exertions of men like Sir Charles Nugent and others who come forward, and without mincing matters tell the country how we stand. I am very sorry I cannot remain with you longer, and I will ask Admiral Boys to kindly relieve me from the duties of the chair. I am sorry that I shall not have the privilege of expressing what I know will be expressed, namely, your hearty thanks to Sir Charles Nugent for his paper.

Admiral BOYS here took the Chair.

Major Sir HARRY VERNEY: It is well to consider all possible unfavourable chances, and Sir Charles Nugent has suggested that if we were engaged in war we should very probably have to do with more than one enemy at the same time. That reminds us, that if an attempt is made to invade us, we ought to provide for it at more points than one, including a possible attempt to land somewhere in Ireland; wherever made, it may be only a feint, in order to divert us from the real point of attack, and our forces might be drawn away in one direction, while the enemy is attacking us in some other part of the coast. It is very desirable that we should bear in mind all the circumstances that might prove dangerous to us in case of an invasion. One is that all the nations of the Continent are now generally practised in the use of arms, and that a certain number of foreigners, living amongst us trained to arms, might possibly be organized to unite and attack us, while our attention is directed to the coast. One object above all, which it would be the aim of an enemy to secure if constructed, would be that which I hope may never be constructed, the Channel Tunnel; for, however safely we might possess the sea, if once one regiment of the enemy were able to march through the tunnel and be masters of our end of it, our command of the sea above would avail us nothing. I never thought that there was any real danger of the tunnel being completed until I heard that Mr. Gladstone was favourable to it. I think that he cannot have considered it from my point of view, but his support of it makes me very much more anxious on the subject than before. I do not believe that it would be a matter of extreme difficulty to organize a body of our enemies in this country. We allow everybody to come into our island and to live here; we place no difficulty at all in their way, and it would not be impossible for a considerable force of an enemy to live here, engaged in various employments, tradesmen, waiters, &c., and at a given signal to unite and get possession of our end of the tunnel. I have always thought that there was more danger of an enemy from within succeeding in an attempt to seize the Channel Tunnel than of a force from without. Supposing that we heard suddenly that a small hostile force of four or five thousand men were landed at one or more places on the coast. We should hurry every man we could to the spot, to drive the enemy out. Is it not possible that thereby our force in defence of the tunnel might be diminished very seriously, especially considering how very small is the amount of troops that we have in

England, compared to the large bodies of men found in other countries? I recollect, with regard to the defence of the country, Sir James Hope's strong opinion was that the most efficient would be with gunboats. I have heard him say: "Give me two hundred gunboats, and I will be bound no enemy shall ever land in England;" but he added, "How long would it take to build them and to supply guns?" I also recollect his opinion with regard to the value of a harbour of refuge on the east coast; and as Sir Charles Nugent has foreshadowed, and as was Sir James Hope's opinion, after being Chairman of the Harbour of Refuge Commission, it would seem that Filey is the proper place. The people about Filey are unable to subscribe any large amount of money towards constructing a harbour of refuge there, and this really is one reason why Filey has been so long neglected. My own conviction is, from what I have heard, as well as from what Sir Charles Nugent has said to-day, that there would be hardly anything of more importance to the country on the eastern coast than a fortified harbour at Filey. With regard to the expense of our Navy and Army we must recollect that they form the cheapest insurance that there ever was for the greatest treasure ever amassed in any country in the world. And that if we take the expense of the Navy and Army as an insurance for such an enormous wealth as is found here, it is but trifling with a most serious subject to object to the cost of protection, when we consider what spoil might be gained in this country if ever a hostile army was able to overrun us. What is the expense of our Navy and Army as against such a terrible disaster as that? What ransom would be demanded by two or more armies united gaining possession of the tunnel and marching on London. Sir Charles Nugent has foreshadowed to us that there is very little preparation in this country against invasion. I hope that there is a grrat deal more than the public know anything about, but one thing is certain, that every commander and every person in a position of authority who would have to act in case of war ought to be forearmed and prepared for it: he ought to be informed what he would have to do, how the force under his command would be employed, and how they ought to be prepared. I am just old enough to recollect the circumstances in the early part of this century, when Sir John Moore commanded in Kent, and when my father for twenty years was Adjutant-General. I remember hearing, though then a child, the preparations talked about. I recollect his saying that the militia was so excellent, the Staffordshire Militia as good as a regiment of the line. I was with him on Crowborough Hill, and he told me the lines of hills that were to be defended between the south coast and London. At that time every magistrate in that part of the country knew where he was to go, in case an enemy landed; where he was to take what force he could command, wagons and farm horses, and carts with stores, preparations of every sort and kind. I recollect his coming home one day from the Horse Guards and saying: "A little old man called on me to-day, and said, 'I have 80 wagons with 8 horses and 2 men to each, and I wish to place them at the disposal of the Government to go anywhere, at any moment, in case there is danger of invasion?' 'Pray, Sir, what is your name?' my father said. 'I am Russell of the Exeter Flying Van.'" Such was the degree of loyalty that everybody contributed all that they possibly could to the defence of the country. At that time we were very much in excess, with regard to our defences, of what we are at present in proportion to those who may be our enemies now, and of those who were prepared to invade us at that time; I believe that Napoleon had 300,000 men at Boulogne, and that we had 400,000 men in this country under arms and ready to engage him in case he had effected a landing. I do think, Sir, that every man who is a candidate for any public employment of any sort or kind, civil, naval, or military, ought to be trained: I believe training would not do any harm to any class in the country. I recollect at that time the city bankers and merchants were many of them volunteers, they were eager to fight and drive an enemy out of the country, in case he had succeeded in setting his foot in it. It would be the same again, but in order that our defence should be successful, we must be prepared, we must be trained. It may be the case already to some extent; but certainly every Commanding Officer of militia or volunteers ought to know exactly what he would have to do in case of war being declared. When it does actually come, there will be no time for preparation. I heard that in six weeks we might be prepared. It would not be six weeks, it would be nearer six days in case of a sudden war. That

is the sort of suddenness we should have to meet. I feel quite certain that the country would be strongly in favour of any proposal that the Government might bring forward for its real defence. There is no sum that could be proposed to Parliament that would not be readily voted if it were certainly required, and if the country were assured that it would be spent so as to secure our safety with the utmost decision, promptitude, and efficiency.

Admiral COLOMB: I venture to think it is proper that a naval Officer should take up the discussion at the point where the lecturer left it. If I had any previous doubts on the subject, they would have been dispelled by the introduction which the lecturer very properly gave. But I wish to draw attention for a moment to the difference in title between what was originally advertised and what is at the head of the paper. In the advertisement there was nothing said about invasion; but I will take the opportunity, if I may, of putting aside that question, as it requires separate discussion. There is a great preliminary question underlying the whole of the gallant Officer's words which should be discussed, and, if possible, answered before we came to any of the particulars in the body of his paper. But before I pass to that, I cannot help making two remarks which have occurred to me during the reading of the paper. The first is, that I have never met any naval Officer who believes that the defence of this country is wholly in the hands of the Navy, as the lecturer seemed to suggest. What I wish to say, however, is this, that I believe the great difference between the way in which military Officers regard this question and in which naval Officers regard it, is that the naval Officer habitually looks at the coast line of the enemy as the frontier of these islands, and that the military Officer habitually looks at our own coast line in that light. The second remark is as to the contrast between the absolute failure of everything military in the country in the form of defence, with the naval state. I do not think I misinterpreted the lecturer. He said that the standing army was so young and untrained that it was incapable of doing much. He spoke of the volunteers as being incapacitated from moving from point to point; they were without the necessary transport, guns, or stores; and last of all he told us, that after all our expenditure and work on fortifications even at Portsmouth, it would take six weeks before they could be made efficient. Now look at the tremendous contrast! Last July what did the Navy do? Without touching our second reserves of seamen, only taking away about half of our first reserves, we put absolutely the whole of our naval force at sea on its old historical battle-field, and it was there ready, not at six weeks' notice, but at five minutes' notice, to do its work. I ask you carefully to contrast the statements of the lecturer with the facts that were under your eyes last July, and to think that there must be some deep underlying cause for it. I have, since I assumed a position of less responsibility and more leisure, taken some pains to ascertain what is going on in the country with regard to this question. I wish to say this, that there is a condition of mind prevalent in the country, which is not the *opinion* of the country, because the other side has not been put before it in sufficient volume to make the country capable of assimilating it. All over the country, in every coast town, in every commercial centre in the United Kingdom at the present moment, there is a sort of propaganda which has set itself up, which is frightening the country into the idea that it is to suffer all kinds of attacks which it has not been used to in previous history. I get a great many cuttings from newspapers all over the country every day on this very subject of coast defence, and I find always the same idea that there are to be, in some way or another, loose squadrons of the enemy, more or less powerful, more or less organized, everywhere preying upon the coasts of the United Kingdom, and especially upon those towns which are situated far up estuaries, that is, those towns which it is most difficult for a naval force to get at. I will instance the case of Hull. I saw in a Hull paper a letter pointing out that the policy apparently about to be adopted in the Humber was a policy suitable for a German, but not at all suitable for an English port. It was said that there were a great many ships going in and out of the Humber on which the great towns of Hull, Goole, and Grimsby lived and moved and had their being. After reading that letter, I looked in the Parliamentary paper to see what the amount of shipping in the Humber came to, and I found it was this, that every year there are 18,678 British ships going in and out, that is to say, that fifty-one

ships every day are passing either in or out of the Humber, and the towns of which I have spoken are entirely dependent for their value upon this very entrance and exit. Then the correspondent pointed out that this being so, the towns on the Humber were busily engaged in closing the estuary by means of submarine mines, which would have the effect of making the entrance and exit of those ships much more difficult in war-time. It was pointed out in the letter that this must be preparatory to adopting the German policy; and what was the German policy? It was to abandon utterly and absolutely the whole of its sea-borne commerce during the continuance of the Franco-German War. Germany put out all its lights, removed all its buoys and beacons, and the expression was, "It sowed the mouths of the harbours with submarine mines." To my great surprise the reply in a leading article in the paper was, "Yes: that was the policy which it was proposed to adopt in war in the Humber." When I ask myself, how is it that this extraordinary fear, which is unhistorical and which does not seem to have any definite basis, has arisen, and whence has it arisen? it seems to me, in part at least, it has arisen from the constant discussions that have been going on as to the defence by land fortifications of our coaling stations and our naval bases; and that having accepted the policy of this land defence for these bases of operation, by some confusion of mind there has been a transference of this idea of fortifying the naval bases to fortifying these ports and those interests which the Navy is especially placed on the water to guard. Lord Harris, for instance, at Hull, quoting Sir Charles Dilke, said: "The arsenals, dockyards, and coaling stations must be armed with efficient fortifications and with the most modern guns, in order that the fleet may be free." Quite so. The Navy would require its bases; it must work from bases, and it would wish its bases to be free. It is held to be cheaper that the defence of those bases should take the form of land defence. But Lord Harris goes on, and you see the confusion of ideas at once:—"That is perfectly true; *our coast* should be armed with efficient fortifications and with most modern guns, *in order that our Navy may be free.*" Free to do what? Free to neglect the duty which it has always done, always since the laws of naval war assumed any sort of shape or consistency. That is not the naval meaning of recommending land defences for the bases. It seems to me to be a different proposition altogether. In the same way, Lord Armstrong, in seconding the Address to the Crown in the House of Lords the other day, so far as I understand him, kept the same view. And yet Lord Armstrong has made himself so thoroughly acquainted with both sides of the question, that I can hardly believe that he actually used the words with the meaning which they seem to me to bear. He said: "At the present time he believed that there was not a commercial harbour in the United Kingdom that was not at the mercy of hostile cruizers, unless watched by a ship of war, *which could be ill spared in time of war.*" What on earth, gentlemen, is the Navy for, if it is not to do those very duties? I am not going to say how, I am not going to say whether a ship of war should be off such ports; but what will the Navy do if it does not do what it has always done, that is, protect the ports and commerce passing in and out of the ports? There is another reason why the question has taken the particular form which it at present holds, and that is, the extraordinary rise in volume of the military voice in the country, combined with an equally extraordinary fall in the volume of the naval voice; and my military friends will quite understand, I hope, that in any remarks I make of this kind I am by no means finding fault with them, I am only putting forward those circumstances under which we live, that the military voice in the country is by force of circumstances very much larger in volume, very much closer to the ears of the country than it is possible for the naval voice to be. Let me give you a single fact in illustration of that point. In the year 1847, which was the first year after the close of the great wars in which this idea of defence by the method of scare, if I must use the term, took its rise, in that year, if you will refer to the Army and Navy Lists, you will see that the naval voice was to the military voice as one to two, but if you will take the Navy List of the present year and the Army List, you will see there that the naval voice is only in the country as one to five; and not only that, but the great mass of the naval voice of the country is abroad out of the way; it cannot make itself heard; it cannot get its views of this great question put before the country to the same extent and with

the same vigour which is displayed by the military voice. Now the whole of what we have heard to-day, the whole of the attacks which have been pictured to us depend entirely upon one thing, they depend entirely upon the idea of the loss of the command of the sea by England. I believe that there is no other way of approaching a question of this sort except by the historical method, and when we go back to naval history we see that never within the last 300 years were those attacks made unless the command of the sea was lost. If you go to the West Indies, from the years 1779 to 1781 you will find the condition which is really assumed for England now. We had possessions in the West Indies, and the French had also possessions there; the two fleets, broken up sometimes, sometimes concentrated, were acting against each other, neither in command of the sea. What was happening there? Sometimes one fleet got the better, sometimes the other, and the result was that the kind of attacks which have been supposed to-day were developed, because there was no command of the sea to check them. But, on the other hand, not a single one of the military preparations, either by the French or by ourselves, were of the slightest use. If the French fleet got the command of the sea they took the islands within that command, military defences notwithstanding. And if the English fleet was in power it took them back again, and so on. A couple of years later in the East Indies you may see precisely the same thing, but you never see these territorial attacks in naval war unless one Power has lost the command of the sea and the other has gained it. You may say that this has all passed away, because our ships are now propelled by steam, and not by wind. But we have had several steam wars since then, and we see precisely the same thing; the Crimean War was a steam war. What happened? We had absolute command of the sea, and our coasts were inviolate, while we attacked and captured those of the enemy. Go on through the other wars; go to the American Civil War, for instance: what had you there? You had the Federals with the absolute command of the sea attacking and capturing Confederate ports, but never Confederates attacking Federal ports. Now what is the real state of the United Kingdom? Let me refer to another part of Lord Armstrong's speech, because it is described there with a terseness and clearness that cannot be easily surpassed: "We had hitherto retained," he said, "our ascendency on the ocean, and it was a matter of life or death that we should continue to do so. If we lost it, our nation would be in the position of a beleaguered city with a community living on half rations, with the certainty of being eventually starved into submission, and of having a war indemnity levied on us, the amount of which would be proportionate to our ability to pay, rather than to the justice of the demand or the clemency of the conquerors." Now Sir Edward Hamley and I were not quite agreed on this subject, but I venture to quote Sir Edward Hamley as having a very clear view of the main position, which Lord Armstrong puts so well. Sir Edward Hamley said: "We are absolutely dependent for existence on these supplies," the supplies that come over sea, "to exclude which would of itself suffice to compel us to accept any terms that the enemy might offer." Now that is our real position, and we have not heard one word to-day of what the gallant lecturer is going to do about these supplies. I will give you one or two figures, which I think will convey some idea of the state of things. Every year in registered British shipping alone, which does not include the whole of the shipping, we have passing in and out of our British ports 614,000 ships, that is to say, there are 1,700 ships going in and out of our ports every day; but, for all the lecturer tells us, we are to go on and do our best without this life-breath on which the country exists. One of the puzzles to me in considering this question is, that this growth of our dependence on the shipping is recent; it was not always so. In the old days we were not nearly so dependent on our shipping as we are now. But now, while the authorities with their lips agree that we are absolutely dependent upon it, they do not develop the growth of naval force in proportion; on the contrary, we have the diminution of naval force, but we have an enormous growth of military force. We have raised the Army Estimates from the 9,700,000*l.* at which they stood in 1847, when we first began to regard our own coast as our frontier, to the 20,000,000*l.* odd at which they stood last year, when we are entirely committed to this defensive frontier. These questions are, I believe, partly financial. Naval men are apt to regard the 34,000,000*l.* which go on our war forces as

probably sufficient, if properly distributed. Military men seem to look at co-ordinate increase of Army and Navy Estimates as legitimate, and the fund from which they are drawn as somewhat illimitable; it is merely a question of drawing it out of the country. What is the state of things? We have about 100,000 men of the regular Army in England at present, and we are spending 26,000,000*l.* Am I wrong if I say that 9,000,000*l.* of that 20,000,000*l.* goes upon the idea of the defence of these islands, and not upon preparing the regular Army for the work it will have to do abroad? And this brings me to the question which the lecturer put forward, and which is a platitude always put forward in these lectures, that is, the disappearance of the fleet. It is always assumed before we begin these discussions that, in some sort of way, the fleet is to go, and you must observe that "fleet" is always used in the singular; it is never fleets. There is always the idea that there is a single mass of ships somewhere, which will disappear in some mysterious way whenever these attacks may be contemplated by our enemies. I think the lecturer in the few remarks he did make about the fleets, although he was obliged from the nature of his position to dispose of them, showed a consciousness that he really does—only it was not in his brief—understand the actual nature of the disposition of the fleet, that there is no such thing as "the fleet." The fleet is the Navy. In warfare there would be no such thing as one fleet; there would always be a grouping of the ships in different fleets as they were wanted. Time does not permit me to do more than to say this, that in old times we depended always on regarding our frontier as the enemy's coast. That was the first thing; but we did not altogether depend on one fleet actively engaged in blocking up the enemy in his ports; we generally, in fact almost always, had a reserve fleet at home. Besides this reserve fleet at home, we usually endeavoured to have as far as we could a chain of lighter cruizers off the mouths of the home ports, and we were then able to assure ourselves of the absolute safety of the country, because if it did happen in the days of sailing vessels (but it is almost impossible that it can happen in the days of steam), if an enemy's squadron did evade one of our squadrons watching it, and attempted to make its way to England for purposes of mischief, it knew before it started that it would most likely find a reserve squadron there, and as a rule it thought better of it, and did not come near these islands of ours. My views on defence are of this kind: they have been forming in my mind for a long time, and by the kindness of the Council I shall fully raise the question again after Easter. But I formed these views in my mind without knowing what very high authority I had at my back. It is only within the last year or two that I have discovered that the views that I hold run absolutely parallel with those of Lord St. Vincent, the greatest sailor-statesman that probably ever existed in the world.

Mr. SETH SMITH (commanding Royal Naval Volunteers): I will not venture for one moment to criticize the military details of Sir Charles Nugent's admirable paper, but I should like to comment upon its general tone which appears to me to be somewhat despondent and sorrowful. He laments, it seems to me, the ignorance and apathy of this country and of the Services on the great question which he has brought before us to-day. Now, Sir, ignorant we may be, but surely not apathetic! We have been told to-day that there are more than 200,000 citizens who have willingly enrolled themselves as soldiers without emolument and without hope of reward, and he and other distinguished Officers have told us that they are more or less efficient and valuable, in fact, I think we may safely say that more attention perhaps of recent years has been paid to the volunteers than almost certainly to any other part of the Army. But these are not apathetic, do not properly belong to the defence forces of the coast. I should like to be allowed to call attention to the efforts already made by the inhabitants of our coast towns to make themselves efficient in any scheme which may be evolved for the protection of the coasts, and to be employed as Sea Fencibles; that body which Sir Charles Nugent is so anxious to see reorganized. These men, if not exactly to be called seafaring men, at least have that love of the sea and that aptitude for sea service which Sir Charles Nugent so highly approves of in our neighbours the Dutch. I am not speaking of the Royal Naval Reserve, because that highly expensive and possibly useful force, if ever called out, I apprehend will be employed as a reserve to man the seagoing ships of the Royal Navy; but I refer to the Naval Volunteers, who have been raised by an Act

of Parliament expressly for the purpose of forming a force available at a moment's notice for coast defence, and who have for some years endeavoured to train themselves for such a service. I hope there may be some naval Officer present under whom the Naval Volunteers have served, who will bear me out in saying that at any rate they do possess a love of the sea, an aptitude for sea service. That more men have not been enrolled than those now belonging to London, Liverpool, Bristol, and Glasgow, is rather surprising, but I may assure you, Sir, and this meeting, that it is not on account of any want of zeal on the part of the inhabitants of other coast towns, for in most of the large commercial ports, especially those on the east coast, which Sir Charles Nugent says is most essential should be defended, a large number of men have from time to time come forward and offered their services, and are now anxiously awaiting official permission to train themselves in any way that the Admiralty may see fit, so that it be for service afloat. Why their services have not as yet been accepted would astonish us, did we not accept the doctrine that there is no official scheme for utilizing them in the event of necessity. But there have been rumours lately that there really is an Intelligence Department of the Admiralty, and if this be true we may live in hope that this zeal and this love of the sea may yet be utilized. Now, Sir, I would like to refer to one other fact which I think may convince us that the country is not apathetic on this question. There is a modest association with its headquarters in London, the "Naval Volunteers Home Defence Association," whose president is Lord Cowper, and whose Council is composed largely of distinguished naval and military Officers who are keenly alive to its importance, and who approve the methods and labour zealously to promote the objects of that Association. Now among those distinguished Officers are several who have held high official positions both in the War Office and in the Admiralty, and those men cordially endorse the action of the Council and of the Committee: whatever their *action* may or may not have been, or when in a position of responsibility, I think it is encouraging to know that "behind the frowning providence of office there shone the smiling face of private approval."

Captain J. C. R. Colomb, M.P.: The remarks I shall venture to offer upon this paper will be very brief. I so cordially endorse what has been said by my brother, that it is hardly necessary for me to say very much. My views are well known, but feeling as I do the almighty importance of this question, and particularly in its bearings as dealt with by my brother, that though he has anticipated an expression of my views, I venture to intrude myself into the discussion for a few moments. In ten minutes it is absolutely impossible to follow the gallant lecturer into the labyrinth of details and the wilderness of alarms that I find in his paper. I think, Sir, that half our difficulties with regard to having a scheme or system of adequate defence arises from the fact that the public mind is in a fog. We have discussions in the House, discussions in the Press, and in the Institutions, over portions of the question, but it seems to me that somehow this nation has lost the power of grasping great and wide national principles of defence, and therefore I consider that in all these discussions, especially in discussions carried on within these walls, which is the home of the experts, it is of the utmost importance that in all our discussions and meetings we should endeavour to fix upon and elucidate some principle, and see if we ourselves can agree upon it or not. It is only in this way a healthy public opinion can be produced. I would preface the brief observations I make on that point by saying, that so far as I am able to gather broad features from the lecture before us, it indicates three general propositions: the first is that our administrative system under which defence is to be provided has failed, the second is that our naval and military arangements are in confusion; the third is that we are not prepared to resist successfully sudden attack. Well, it is hardly necessary for me to say in this Institution that, personally, I cordially agree to these three propositions, but the practical question is, how is the evil to be cured? I think there is only one answer to that question, and it is by the force of intelligent public opinion being brought to bear upon main issues. That being so I go further, and say the experts, those who are before the country as experts and authorities of both Services, cannot altogether hold themselves free from blame, if public opinion is as it is, for I do venture to say, looking back even at the Journals of this Institution, that you cannot from those Journals at all clearly understand whether naval and military experts

themselves are agreed upon main issues or primary principles, and the main, fundamental, and primary principle is this, whether our greatest and primary national danger in war will be on the water or on the land. That, Sir, is the question which dominates all others, and I take the teaching of this paper to be that while very vaguely and indistinctly admitting that there may be great national danger on the water, still we may leave that largely to chance, and may settle down to dealing with the details of protection on the land. I most strongly protest against that doctrine. Until you have settled what and where your main danger is, you cannot settle your national policy of defence for it; you cannot do it, and the country will refuse its funds and will draw its purse strings tighter the more they see confusion and conflict of opinion among the experts. I need hardly repeat for the hundredth time that I range myself on the side of those who say that investment is a greater danger to England than invasion; and I repeat once more that invasion is only possible when investment, partial or complete, is almost certain, and that when that condition of things has arisen by which all commercial transactions, which are the life-blood of this nation, are stopped because your fleet has mysteriously disappeared, been beaten or insufficient, then I say the enemy would be mad to invade you when he can accomplish your ruin without landing a single soldier. Invasion is only possible where investment, partial or complete, is a fact, and all arrangements which secure you from investment, partial or complete, are arrangements which secure you absolutely from such an invasion as the lecturer so calmly contemplates. Sir, that is my main contention, and I should very much like to see a meeting called at this Institution of naval and military experts, and to have that question put finally and simply before us and voted upon, because the country will only give a certain amount of money for defence, and it will be the more parsimonious the more excuse it has, and the greater excuse it has for being parsimonious will be this, that the experts cannot agree on the most simple and common sense main issue. Well, that is briefly but very strongly my view, and I cannot look around me at what is now passing on the Continent without feeling that all those who lift up their voices here or elsewhere on the subject of defence incur a very grave and great responsibility, for which posterity will hold them responsible, if they confuse the mind of the country by shirking their clear duty to define and elucidate main issues. In conclusion, I wish to ask Sir Charles Nugent two or three questions which, if he can answer them, will help to some extent to turn the mind to consider the main issue which is this, what is to be the fundamental principle of British defensive policy? I wish to ask him as a distinguished military authority long associated with the War Office, are we to understand from his paper that no invasion is in his opinion to be apprehended save by a force equal to the task of marching upon and seizing London? The next question I wish to ask is, is it not the case, that we have roughly nearly half a million of men in this United Kingdom maintained for the express purpose of preventing that march, and not available for service abroad? Thirdly, I would like to ask him what is under these circumstances the numerical estimate of the invading force; and fourthly, what is the transport required to carry that force across? Fifthly, from what ports abroad he considers this force could start? And sixthly, what is the average carrying power available usually at those ports and under the flag of the Power owning the ports? Next, I would like to know if he asserts that sufficient transport for the estimated invading Powers is always at these ports, and at the disposal of the nations owning those ports, and if not how long will it take to collect the carrying power at those ports, and what is the data and basis upon which he calculates that element of time in its collection. These are some of the A B C questions I at all events have been endeavouring to get an answer to from purely military experts for some twenty-two years, and I have never had an answer to them yet, and I say do not blame Parliament, and do not blame your statesmen for apathy if experts who cry "Invasion" cannot answer these first fundamental questions.

Admiral Sir GEORGE ELLIOT: I will not presume to offer any remarks with regard to the question of land defences after what we have heard from Sir Charles Nugent; I am not competent to do so. But I think he will excuse me if I venture to point out one blot in his lecture, as he has mentioned some points connected with naval defence. First of all, we look at the chart and Filey Bay; we see an

anchor which represents a harbour of refuge, and a most important harbour it would be in war-time for the defence of the coast. I see an anchor also at Milford, another at Portland, and another at Lundy Island. Now I am sorry to see no anchor at Scilly, because I look upon the Scilly Islands as a most important outpost and harbour of refuge in war-time for this country.

Sir CHARLES NUGENT: I ought to have explained that map was for quite a different purpose, and these "anchors" you speak of have nothing to do with this lecture.

Sir GEORGE ELLIOT: You have mentioned Lundy Island in your lecture.

Sir CHARLES NUGENT: I did not deal with that coast.

Sir GEORGE ELLIOT: I thought you dealt with the south coast and east coast.

Sir CHARLES NUGENT: I did.

Sir GEORGE ELLIOT: That is the most salient point of the south coast.

Sir CHARLES NUGENT: The south coast from Portsmouth only.

Sir GEORGE ELLIOT: Well, you are fortunate in leaving off there, as unless the Scilly Islands are fortified as a coaling station, all the cruizing vessels in the chops of the Channel, where they will be looking out to protect our commerce, will have to come to Portland to get coal. Scilly Islands is one of the most important stations connected with the defence of this country, and in all former wars were strongly fortified and garrisoned, and now I think there are only two old guns lying somewhere in a ditch. If an enemy got possession of Scilly Islands, it would very quickly be defended by torpedoes, and to a certain extent it would be a great danger to the country. If you go further on another occasion, I hope you will not forget Scilly Islands.

Lieutenant-Colonel WETHERED: Sir Charles Nugent deserves the thanks of the meeting and the country for having brought this subject before us. I am very sorry to see by the discussions which have taken place that we are not the amphibious body I had hoped we might be. As far as I remember, though I cannot say I have followed very closely the lectures that have taken place here, naval men have brought before the meetings the insufficient state of our Navy, and given most minute details of the ships composing our Fleet and the manner in which other nations were creeping up in their strength, especially the French, showing that they have gone up very nearly equal to that of our Navy, and I would ask, supposing there is a combination of two Powers, say France and Russia, what would be the result? Consider what our Fleet has to do. We have not only our Colonies to guard, but we have that great and important thing, our commerce, to protect. So long as our Fleet has command of the Channel, we should not be in much danger of an invasion; but I want to know whether such a combination as may arise might not cause an investment of our country. Considering the enormous work our Fleet would have to do, I think the idea of the lecturer and of all military men has been this, that we should, as far as possible, allow our Navy to be unencumbered by having to defend our coasts; that the Fleet should be left free to strike a blow at any given point, to blockade the enemy's ports, protect our commerce, and watch our Colonies. Surely that is work enough for our Navy, however much it may be augmented on an emergency; and we in England as military men would like to feel that we could defend our sea-girt island independently of our Navy. Our isolated position affords every advantage for defence, but I do not think we have any organized plan or arranged system of defence; any means whereby we could concentrate a body of men on certain strategical points of our coast would be a great advantage. We neglect the means that our railway and telegraph systems give us. Our railways afford very great opportunity for concentration of men and material, and there is no doubt the railway lines themselves, previously supplemented by branch lines to strategical points of our coast, and if heavy guns were mounted upon suitable railway gun-carriages, could be fought from the railway metals with great advantage. My idea has been, that we ought to have fortified centres around and within certain distances of London as our base of operations, where we could accumulate a large force of guns, artillery, and material of every kind, which might be dispatched to any part of the coast to defend our shores. With regard to our Navy, suppose we have our cruizers out watching the enemy's ports and ships, some of our fast vessels would have to run

in and communicate with the shore; but what advantage our telegraph system would afford us if it were properly carried out! Why should we not make provision for having our lightships (and other vessels anchored at extended distances from the coast) placed in telegraphic communication with the coast, so that our cruizers could communicate from these telegraph posts what was going on on the opposite coast. This would be a great saving of time in communicating with the shore, and prevent our cruizers leaving their cruizing ground. I quite agree with the lecturer that we shall never accomplish anything, talk as much as you like, until we have some experts placed at the head of the different branches of the Service. To place a civilian political Secretary for War virtually at the head of the Army, who does not profess to be an expert, is suicidal. The Secretary of State has permanent officials who are experts in numerals, but whether those figures represent effective men, horses, and guns or not, is of little consequence from their point of view, so long as they can manipulate their estimates and returns to keep the country quiet. The money granted for army service is not expended advantageously. Look at the great increase that goes on in the cost of the Administrative Staff of the Army. In a few years it has nearly doubled, without any corresponding increase in the bulk of the Army.

Major E. GUNTER: In common with all my brother Officers who are interested in their profession I feel grateful to Sir Charles Nugent for bringing this most important question before the authorities and the public, and especially, locally speaking, for his remarks regarding the requirements of Dover. There is one statement, however, in his lecture which I do not like to pass by without some perfectly respectful comment. In speaking of the advanced positions which would have to be drawn up to check the march of an invading army on London, he says that digging and shovelling would be required, that these things require practice, and that for this purpose the infantry of the line would be useless. Now I venture to say that if Sir Charles had been down in the south-eastern district during the past year, he would not state that infantry of the line were useless for that work, for a great deal has been done by the infantry. I will not venture to go into the larger part of the question, but this much I say, that Sir Charles would be astonished to see what work the infantry, instructed by their Officers, have done in this matter, and he would be surprised at the interest that the men themselves take in it. I do not speak of mere humdrum digging and shovelling, but of what we may call the more picturesque part of the work, the weaving of the beautiful (though somewhat brittle) brushwood, the laying of the symmetrical sand-bag. All this has its charm for the soldier, little as you may think it, beyond the routine of his daily work, and I hope I may say we are doing our best to instruct the men in this most necessary and useful work. I should not like it therefore to go forth as the dictum of so able, experienced, and influential an Officer as Sir Charles Nugent that the infantry, with the exception of a few regiments, are useless for this work. At the same time I may venture to say a word also on behalf of the volunteers. Last year three battalions of engineer volunteers went down to Dover for the Easter Manœuvres. I don't know whether Sir Charles was there. If he had been I think he would have been very pleased to see the work done by the men in this very way, in hastily preparing a position for defence.

The CHAIRMAN (Admiral Boys): Before asking Sir Charles Nugent to reply, I have just two points I should like to refer to in reference to this lecture. One is the comparative strength of the Navy—what it is now and what it was when we were last engaged in a naval war—in view of the additional duties that it would now have to perform. In the year 1799 there were at one time lying in Torbay fifty-four line of battle ships and there were eleven more coming round from Plymouth to join them. That represents a fleet that we could not put together at the present moment, and yet what we have to do now-a-days in protecting our commerce compared with what was required, they might be multiplied by six or seven. With reference to the state of unpreparedness now existing as stated in this lecture by Sir Charles Nugent, if I do not agree with the whole of it, there is no doubt an immense deal of fact produced, I think it is derived to a great extent from our system of party government. For many years there has been no continuity of naval policy. Whenever there was a change of Government, what the former

Government decided on, the new Government coming into power found all wrong, and the great object was for the Government to frame its estimates for the Services more with regard to a reduction of those made by the Government preceding it, than for efficiency. I must say, however, this has not been the case lately. I will now ask Sir Charles Nugent to reply to the discussion that has taken place.

Sir CHARLES NUGENT: Admiral Boys, ladies and gentlemen, as I listened to the naval gentlemen who have commented upon the paper, I began to think I had done something very wrong, and my first impulse was go out by that door. Thinking upon it farther, however, it occurs to me that our difference mainly lies in this, viz., that we start from different points. No doubt there is an alteration in the title of this paper, it was made by me at the last moment, but made in innocence, not supposing that it would bring a hornet's nest about my ears, nor do I think it need have done so. Severely as Admiral Colomb has spoken, I feel my shortcomings the more, inasmuch as he is supported by his brother, who is a great authority also. I will endeavour to set myself right, but really at this moment I do not know from what Admiral Colomb says whether he considers that the Navy with its present strength is sufficient of itself for the defence of this coast line.

Admiral COLOMB: Certainly not.

Sir CHARLES NUGENT: Then if it is not, I cannot see any reason why this country is not liable to invasion. I start with that. Take the next point, Admiral Colomb says that properly we should consider our enemy's coast line our frontier. Why should not our enemy treat us in the same way? and may he not do so? For I have heard naval Officers of great experience say in this theatre, that the French Navy is equal to our own, and some of them have even said it is superior to our own, and then I see no force in the argument, because if the opposing party who considers that our coast line should be his frontier is stronger than we are, I think that our position is not bettered by the Admiral's view.[1] It is impossible in the little time which remains to answer all the points raised, but the Admiral has said he means to raise them again after Easter. I shall be very happy in a friendly way to meet him, and endeavour to arrive at some joint understanding upon this great question. There is a point, however, which he mentioned, to which I think I should refer. He said, and he won't mind my remarking that I thought there a little feeling was manifest in what he said, that the Army got so much and the Navy got so little—indeed, he said that out of the 19,000,000*l.* voted annually for the Army he believed 9,000,000*l.* were spent on fortifications.

Admiral COLOMB: No, defences.

Sir CHARLES NUGENT: Land defences.

Admiral COLOMB: Not necessarily.

Sir CHARLES NUGENT: Well I am glad we have cleared this up, because I understood the Admiral to say, referring to the Army, that it was spent on defences. However, I do not agree as to the amount. As far as the Military Estimates are concerned I cannot make out that more than 150,000*l.* was spent upon defences during the past year.

Admiral COLOMB: As there is a misapprehension I may be allowed to put it right. Historically the standing army has always been the attacking force of this country, not the defending force. It consists of 100,000 men roughly. 20,000,000*l.* are spent on the whole army. Now I cannot conceive that more than 9,000,000*l.* or 10,000,000*l.* are spent upon the 100,000 men that are properly the attacking force, and if we had war with the two countries which are most likely to unite against us,

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[1] In those times, when our enemy's coast line was our frontier, if my memory serves me, and I have no books of reference by me, the enemy's coast swarmed with lugger-rigged boats, of great size, carrying large spread of canvas, numerously manned, and heavily armed, which in spite of our cruizers on their coast line crept across the Channel, taking advantage of calms (when they used oars) and fogs, and cut out our merchantmen in our own waters, indeed the loss of vessels in our own waters was of daily occurrence; notices were posted at Lloyd's, and the rates of insurance ran up enormously—indeed, I am not sure but that the underwriters contemplated declining insurances in some cases altogether.

the whole of that 100,000 men would have to go to India. What I mean is that the rest of the military force is necessarily a defending force, part of it fortifications and part men, and so on, but the other 9,000,000*l.* appears to me to go for that defending force.

Sir CHARLES NUGENT: The Admiral further reproached me with having given you old platitudes. That you have heard very often before my view of the matter is quite true. I have said a great deal of this before, and I am only sorry to say that the matters to which these platitudes refer are so much worse than I thought they were. I join issue with him at once about the fleet. Of course I do not attempt to set my authority against his with regard to the Navy, but I do distinctly say, that the Navy as at present constituted has something else to do besides the defence of these shores. If you take the Navy you find that we have certain ships, gunboats, and other craft called coast defence vessels. Well, if I understand what a coast defence vessel means, it means something set apart for the defence of the coast. Now looking to the fact that our coast line is about 3,000 miles in length, and that the whole coast defence lies in that small force of which I gave you the numbers, and which numbers no naval Officer here present has challenged, then I say that the coast defence force is utterly inadequate to the purpose for which it is set apart, that you might almost as well throw it into the water. That is my view of the matter. Then with regard to the Navy, the gallant Admiral quoted history. Of course you cannot get over history; still I have no objection to the historical method: let us go to history, and in history I find that in 1786 Pitt, the Prime Minister, and having the best means of knowing, said that owing to the want of defence works for the capital, as well as for our shores, our Navy was set to do work *it had no business to do* in carrying on a defensive war, wasting our resources and impairing our strength without benefit. It is almost impossible to follow all the points, but the Admiral's best point was that the general tenour of my remarks was to show that after all this the military expenditure was worth nothing, and that, although we have a force of some half a million men, that we have this force in vain. Well, the whole point of my paper was, not that we have not enough men, but that our organization is such that we could not immediately use these men to the best purpose. I have said, and I say it again, that it is the organization that is deficient. It may be that a better time is coming, and I have heard it whispered that we shall have an organization that will allow us to use them, but as far as I know we have not got it at present, and I hoped, in vain, that some military men having authority would rise and say that we had. I have worked to a *brief*, and the *brief* on which I have worked is the coast line, indeed I am not at all sure that I should have touched the naval part of the question at all, except as far as the amphibious portion thereof is concerned. I have over and over again dealt with the necessity of safeguarding our commerce, and of how much depends on it, but I do not think it necessary for my purpose, indeed I do not think it within the scope of what the Council of the Institution here committed to me, that I should deal with that now. I dealt as I thought with the danger when it approached our shores, and in order to save time and a certain amount of iteration I dealt only with the particular part of the coast line which I specified. Sir George Elliot referred to the Scilly Islands as being a very important place, and he laid it as a fault to me, that I had not brought in the Scilly Islands or Portland. I did not, because they did not fall within this specified part of the coast line, but I could not be ignorant of the value of Portland. I was there some years, and the defences grew under my care; and also in this theatre I have dwelt more than once on the value of Scilly as a lookout point, and of Scilly Islands as suitable for a harbour of refuge. Mr. Seth Smith said I spoke of the ignorance and apathy of the country and of the Services. but I do not think my remarks had direct reference to the Services. Admiral Colomb has shown us that there is a growing feeling in the country which may be turned to good account; nevertheless, the country is to a great extent ignorant; I do not, however, impute to the naval members of the Service apathy, still I think much more might be done than we have done. I did not compare ourselves with the Dutch of the present day so much as with the Dutch of the past, and I think there is a great analogy between the two. Captain Colomb, for whom I have great respect, for he has ventilated these questions even more than his brother, entirely endorsed

all that his brother has said, and he added that he was going to put to me three questions. I thought I could answer three questions, and here are his questions on this paper, and really a competitive examination is a joke to what I have here. Here are eight questions. I will answer the first three of them. I am not afraid of the others, and perhaps at some future time I may have the opportunity of answering them all, indeed I think that there is no difficulty in giving answers now to all of them. The first question he asks is, Do we understand that no invasion is to be apprehended save by a force equal to the task of marching upon and seizing London? Well, I have already answered this in my paper, wherein I start by stating that the object of invasion is London. An enemy may levy a contribution on Liverpool, even take it, if you like, or he may go to another place and do the same, but that in my opinion is not invasion. Invasion has London as its object; I cannot see for what an enemy should come here in force except for London. The second question he asks is, Is not it the case that we have literally some half a million of men available for resisting invasion? Yes, it is the case that we have more than half a million of men available, but from lack of organization, not in a state at present to resist sudden invasion, which is the point of my paper. I see that you have the men, but as far as I can see, and I have no special means of information, they are not ready, lack of readiness is the point I desire to make. Thirdly, he asks, What is my estimate of the force required to invade this country? To that I reply, and I have endeavoured to look at this matter from the *other side of the water* point of view, to that I reply that no ruler in his senses would think of invading this country with less than 200,000 men. We do know that Napoleon started with 135,000 men, but that he increased them to 178,000. Going on, Captain Colomb asks what is the transport required to carry this force over the water, and I think he also asks, from what ports are they coming? Should I deal with this as one of the three questions I have undertaken to answer, I would tell you the ports from which I thought they would come; however, we do know that from Texel to Brest Napoleon did collect in all the ports opposite sufficient transport, 2,290 vessels in all, to convey these 178,000 men, with 432 guns, 14,600 horses, Transport and Provisions, and he carried his preparations so far in these ports—I could give you the names of all them—so far that he could embark the whole force in 11½ minutes, and disembark it in a scarcely longer time from the final sound of the bugles. History tells us that the great Nelson, the unapproachable sailor, was decoyed away by the artifice of the French to the West Indies, and lost a certain number of weeks, three I think, during which time this country lay almost at the mercy of the French. And that Napoleon's project failed was due to the superior sailing of the "Curiena" brig, a brig taken from the French themselves, which brought information to England from the West Indies. If Villeneuve had carried out the instructions of Napoleon, the French would have been in England, and God knows what would have happened to us; and more than all this, I say that the proper way to test this question is to put yourself in the opposite position: well, if I were an autocratic ruler with a million of armed men opposite, I never would rest till I had brought England to her knees. If you have the fighting men it is something worth fighting for, is the supremacy of the sea. Does not every nation in her secret heart, I won't say hate us, but look at us with an envy very much akin to hatred? And why should not they come. I am sure that our present fleet, the fleet which our Admiralty provide for us, is not sufficient to prevent an invasion with prospect of success.[1]

Admiral COLOMB: If they are rash enough.

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[1] In the beginning of this century we had 115 liners and 308 cruizers, besides a special flotilla for the coast and the Thames, and we had also 90,000 seamen, 30,000 marines, and 25,000 defencibles, and I am under the impression that we had upwards of 700,000 land forces under arms, yet our enemy could not at that time dispose of half the military forces a possible enemy can dispose of now, and it is matter of fact, that we were then open to invasion, although our Navy then had not to do probably one-half of what our present Navy, some 130 liners and cruizers, with half the number of men, has to do now.

Sir CHARLES NUGENT: Yes, if they were rash enough to start, is not sufficient to be relied upon for absolutely preventing them from getting here after they had started. It only remains to apologize to Major Gunter for having spoken as it seemed disparagingly of the line regiments. I really did not mean disparagement, I thought that the line soldiers had not generally had sufficient practice in digging and shovelling, and I still think that the generality of them, those at least who have not had over three years' service, cannot be sufficiently hardened to be depended upon. I do not, however, despise them; I believe that under their Officers they will do all that can be expected of them. In conclusion, let me repeat that my attention was principally directed to the coast line, that the enemy were brought to the coast line by the Council—I did not bring them—and that when they approached the coast line I was to deal with them as I could, and I here endeavoured to show that with the means at disposal it was not so easy to deal with them—at any rate I have not knowingly exaggerated or diminished anything.

The CHAIRMAN: I am certain you will authorize me to thank Sir Charles Nugent for his very able paper, and for the interesting and good-natured though critical discussion which has come from it.

Wednesday, March 7, 1888.

CAPTAIN THE RIGHT HON. LORD CHARLES D. BERESFORD, C.B., R.N., M.P., in the Chair.

ON THE CONDITION OF THE MERCANTILE MARINE PERSONNEL AND MATÉRIEL, WITH A VIEW TO ITS MORE COMPLETE UTILIZATION AS A RESERVE FOR THE ROYAL NAVY.

By Lieutenant W. C. CRUTCHLEY, Royal Naval Reserve.

The CHAIRMAN: Ladies and gentlemen, I have the pleasure to introduce to you Captain Crutchley, who I am sure will give you a most interesting lecture. I may mention that we are very much indebted to him for giving us this lecture to-day, as he is going to sail to-morrow. Therefore it must have been a great personal inconvenience for him to devote his last day at home to giving us a lecture which those of us who have read it consider very interesting and very beneficial to the country.

AT no time prior to this has the world ever seen so great an array of ships as now traverse the ocean in all directions. Truly the seas but join the nations they divide. One looks back with a degree of wonderment and admiration at the records of an old East Indian voyage, where, with a vessel of 500 tons, and what would now be a man-of-war crew, she sailed 200 miles in a day, and it was thought the perfection of navigation. The wonder is excited when one thinks it was so short a time since, and how much has been done in the interval; the admiration comes freely when reflecting that accurate charts and chronometers were unknown, and men found their way by dead reckoning and lunar observations, or more frequently still by a noon Summer line. Little more than two centuries ago, the good old motto, "No peace south of the line," found its votaries in almost all seamen. Our first and most famous navigators, tried by the laws of to-day, were little better than robbers; let me rather say they had a peculiar talent for annexation. The retrocession of property was made when people were strong enough to take it back, and this is not so very widely different now. But these men that sailed south were *traders;* their business was to make money, and keep it when they could, so they cultivated the art of war when seeking the needs of peace, and this faculty for the acquisition of property, and extension of our Empire, made England the dominant Power we now have the privilege of belonging to. They knew, however, that to get was one thing, and to keep was another, and the merchantman of those days considered fighting a legitimate part of his business. If this state

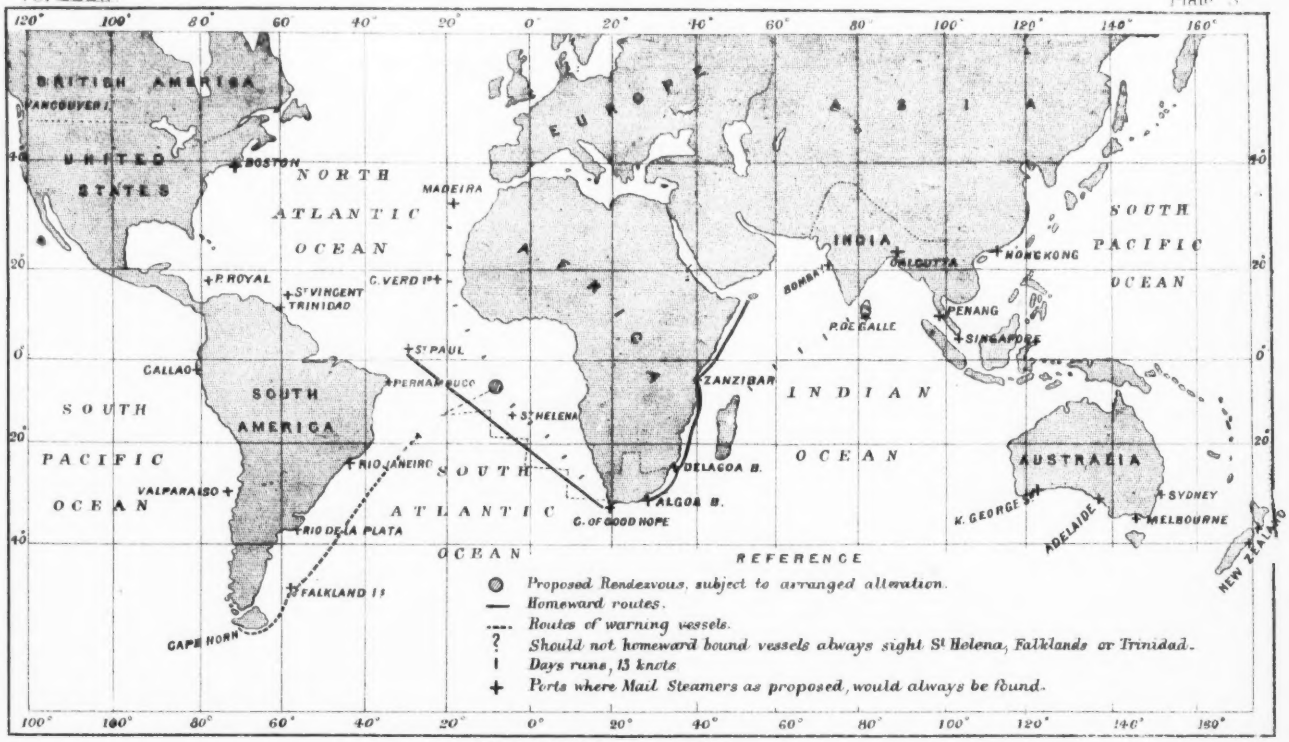
of things applied then when we were few, and the empire of the seas was claimed by other nations, how much more does it now, when our fleets cover the seas, and there is no corner where the British ensign is not seen? Are our ships worse than our neighbours', or have we deteriorated as a nation, that because we are so numerous we are not to take advantage of that fact to provide for our own safety? I know that warfare has grown extremely scientific; but if we are engaged in a great naval war, all or most of the science, both on our own and on the enemy's side, will be taken up in opposing itself, and outside the regular line of battle, will be used, as before, ordinary weapons with less training, but still the confidence begotten of one's own resources. There is always a glorious element of uncertainty in all maritime affairs, and perhaps it is the last and great charm of the sea that it refuses to be fettered, and remains as ever a most capricious mistress.

If in dealing with this matter I find myself on ground which I have traversed, I must plead that when before speaking on a kindred subject I have used arguments and drawn conclusions that must necessarily have a place here. My previous paper[1] must be regarded as a part of a whole, which I should scarcely have attempted, had not the subject been suggested by the Council of this Institution, I hope not with misplaced confidence; but I must ask for every allowance to be made for me, my opportunities for gaining information have been small, and the only qualification for the task I possess is a thorough knowledge of the merchant service, and a keen desire to see it take its rightful place in the estimation of the country. If in any remarks I touch the susceptibilities of anyone, I can assure them it is unintentional, for no one knows until they try, how difficult it is to deal with such a subject without saying something that will start some one.

In looking at this matter, the "Personnel" and "Matériel" are closely allied, "Merchant men and Merchant ships;" the men enrolled in a force possessing a certain amount of coherence only, permitted to sail to all corners of the world until called out by Royal proclamation. The few Officers are perhaps in ships without men, the men again here and there perhaps with no Officer nearer than the nearest man-of-war—what is the best thing to do under the circumstances? I am not sufficiently behind the scenes to know what steps would be taken by the naval authorities on any matters connected with the Naval Reserve, so must regard it solely from the view of a man in my own position.

"How are these Officers and men to be brought together?" is the first question. The coast lines of the world extend for a few thousand miles, and they, the men, will be found on each and every part of it, from the Dundee whaler, as near the North Pole as he can get, to the New Zealand liner amongst the ice of the South Pacific, and the object is to get these men together to join in the great struggle for

[1] "On the Offensive and Defensive Powers of Merchant Steamers," see Journal, vol. xxx, No. 134.



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the existence of their country and its pride of place amongst nations. Truly the object is a great one, and the means taken to secure the end will needs be large in proportion. In all my remarks I am assuming that our Navy, excellent as it is, *needs* to be supplemented by a far greater number of seamen than it now possesses, and that the want of them is absolute.

The natural reply to the foregoing question is "Put the Officers and men in the same ships;" it appears to me to afford the only solution of the difficulty, and as I am not at all a believer in impossibilities, I shall try and find a plan that will answer for the purpose. In so doing, the great difficulty will be in propounding any scheme that will at once suit the many conflicting interests that it is wished to combine—you have firstly the shipowner, next the shipmaster, then the shipman. The shipowner says, and rightly enough: "I am not going to be put to any expense or loss because my ships or men are wanted. If the authorities require my assistance, I must be paid for rendering it. I pay my taxes and expect my property to be protected, and unless you appeal to my business instincts, beyond that I will not go."

The shipmaster says: "Yes, I should be very pleased to help in any way. I don't know anything about fighting, but I could learn to do as much with my ship as any other fellow, if opportunity were given me. If war broke out it would not last long, and I might do well running a blockade, but if I had a fair chance I would rather help my country. I cannot, however, be expected to ruin my prospects and throw up my berth for honour and glory, when, the crisis passed, I shall be thrown on my beam ends. I pay my taxes, and let the men fight whose business it is to do so."

Jack says: "Yes, I'm a Reserve man, and if I am called out I shall go; I expect I can put in my time just as well as another fellow. I don't *dislike* the Reserve, but if you want me to give up my favourite ships and sail in those you want me to, you must make it worth my while to do so."

That I think is a fair *résumé* of the question as it now stands, there is no obstacle in the way, save that except Jack the other two are not interested in the matter, and any move they may make is at their own expense, and very possibly at their very proper risk and peril.

The first question on this latter point is: "Is an armed merchantman an infringement of the law of nations?" I mean, is not a man, State aided, allowed to carry arms in his own defence? I was under the impression until this morning that by a statute 22 and 23 Charles II, chap. ii, a merchant vessel was bound by law to defend herself against anyone. I find, however, that all the laws on the subject were repealed in 1863, which I believe was the date when the Admiralty ceased to arm merchant vessels. I mention this, because, if merchant vessels were sailing in convoy, and some were armed, it is quite necessary that the point should be settled, so that if attacked by other armed merchant vessels of another nation, they should legally be able to defend themselves. Any serious attempt to harass our commerce at present would have to be made by vessels of their own

class, as there are not enough foreign men-of-war to give ours the slip and attend seriously to the destruction of our merchantmen.

Secondly. "Is there any posible way by which Officers and men may be brought together in the ships in which they would be most useful and handiest got at?" Yes, I believe there is distinctly a way, and it is one that I do not see would impose a hardship on anyone. I will deal with the case of Officers first. The number of Officers in the Reserve at present is very small—perhaps if a new departure is to be taken, it is as well. But if there were a sudden war-scare now, where are the Officers to fill up the vacancies in the Reserve? There would doubtless be lots of volunteers; but when all is said in favour of volunteers at the last moment, it smacks somewhat too strongly of trusting in Providence alone; and here I am tempted to quote words put into Admiral John Hawkins's mouth by Charles Kingsley: "'Taint no use trusting, young man, you go and *do*—works is the trade." And we know that on a national emergency all the retired and reserved Officers that are effective would be called out, and everything that would float placed in commission. In any new over-sea contracts for mails entered into by the Imperial Government, make it one of the clauses of the contract that the vessels are to wear the blue ensign and comply with the regulations for so doing. The vessels contracting would be first-class ships, and the inference would be that they were officered by first-class men. If the Commanding Officers were not Officers of the Reserve let their names be submitted by their owners as fit to hold commissions either as Sub-Lieutenant or Lieutenant, according to their seniority. And where does the hardship come in? I do not think that any scheme of promoting from midshipmen will ever efficiently officer the Reserve. The merchant service is such a case of the survival of the fittest that it is almost pitiable to see the numbers of youngsters who start with good chances, and yet come to grief before they even hold a master's certificate. If this scheme were once adopted the drill difficulty would be got over at once; for how is an Officer that is at home perhaps one month out of twelve for fifteen days at a time to get up in the middle of the night so as to be on board the "President" by 9 A.M.? For senior Officers at the present time, belonging to the Reserve may be classed under the head of luxuries. Anyone connected with large steamship companies knows the ease with which an Officer can be granted leave for a voyage if the authorities are willing, as there are usually a few spare men on shore to carry out shifts and changes in any ship; but it may be said, "Perhaps the Officers would be unwilling to hold commissions?" My reply is then, make it to their interest; if they are necessary you must have them, and if it is not to their interest to join they will not, unless you make it so; but my belief is they would be pleased to do so if they could only see their way clear to fulfil their obligations and not to be left in the lurch at the close of war! This latter possibility fades into the dim distance, however, if the mail steamers of England have to wear a blue ensign. I am, perhaps, dwelling on the case of the Officers: for unless you provide for their being in the ships who is to look after the men? And

more especially would I urge the great necessity there is for endeavouring to enlist the services of the men in command of the various Channel mail steamers—south, east, and west. It would be hard to exaggerate the importance of the work that might be entrusted to these Officers. At sea, night and day, knowing every appearance of weather and every corner of the coasts, their knowledge and assistance would be invaluable, and would be worth obtaining—even were special regulations made to obtain it!

Is it not possible to establish in certain vessels, now, the nucleus of a crew which should remain in them when actually wanted for State purposes? I think it is.

Complicated as men-of-war are with their (numberless, I was going to say) many engines of all descriptions, the large passenger steamer of the present day is hardly less so; and when I know the time it takes to become acquainted with the interior arrangements of a large ship, I find myself wondering how they are to be manned in war-time if the original crew is not to be retained. In looking at this point, I think we ought to consider how an emergency would be met with the means at our disposal in a year or two's time! And I am afraid that unless some means are taken to draw engineer Officers into the Reserve now, the payment of large sums will not produce the staff wanted on an emergency. You would, doubtless, get numbers of men, but they might be strangers to the class of vessel they would have to serve in, and that, as I have pointed out, is a serious source of weakness. I do not for an instant say that the Staff would not stay in a vessel so taken up if they were well paid to do so, but it is trusting to an uncertainty to assume that they would; and again, engineer Officers are a peculiar set of people to deal with, and have their unions to fall back upon in the event of a disagreement.

Is it not worth while to consider the advisability of offering a moderate retainer to induce engineer Officers to join the Reserve? I think the necessity for them is apparent, and how else are they to be obtained? I do not think that the staff of Royal Naval Engineers is large enough to draw on for the purpose, and even if it were, I should doubt the advisability of a mixed engine-room staff. I should put this matter as the first of the real requirements of the Reserve.

With equal force, or nearly so, the same remarks apply to Officers. The Lieutenants' List is woefully small—thirty-seven by the List at hand, with 101 Subs. At the most not more than half could be reckoned upon if wanted in a hurry, and where the Officers are to come from to man store ships of all descriptions, despatch vessels, and armed mercantile cruizers, I fail to see. Doubtless lots of men would turn up when wanted. England's sailors have never been very backward yet when there was the chance of hard knocks going; but at the time their services would be most wanted they themselves would be acquiring the rudiments of gunnery, with their men knowing more about it than themselves—not a very desirable consummation. And there is also another matter. If a commissioned Officer in command of an armed merchant steamer is not to fire a shot in his own defence, save at the risk of hanging, what would become of men not commissioned

if they were captured? I suppose they could only be hanged once, too; but it does seem strange and curious that with our enormous mercantile marine the number of Officers cannot be brought up to the full strength of the Reserve. It speaks for itself that there is something radically wrong. Here is the list of what it is supposed to be—or contemplated:—

	Present numbers.
150 Lieutenants	42
270 Sub-Lieutenants	102
150 Engineers	4
150 Assistant Engineers	3
200 Midshipmen	134

And it may be assumed that most men now commanding first-class steamers are well qualified to hold commissions if it suited them to do so.

The new regulations that have been in force for the last eighteen months hardly seem to meet the present requirements. To take one thing, promotion of Sub-Lieutenants: it is curious to see a newly-appointed Lieutenant by a sailing-ship qualification serving as junior Officer to a Sub- who has been in steam for years and is his senior in the merchant service. I do not know that the command of a sailing vessel would make a more useful watchkeeper in a steamer than a man with less years in sail but more in steam. There are many other details of a like nature which might with advantage be altered and doubtless would be were they only understood by the powers that be. It is quite clear to me how great the difficulty is in reconciling the separate conditions of the two services to meet all requirements: but it must be a very tight fix indeed, that there is no way out of. I don't remember seeing many, and doubtless this will come right in time; the only question being whether there is the time to spare.

Does not a force of 17,890 men without any petty officers seem an anomaly? It appears so to me, and this is the present condition of the men of the Royal Naval Reserve. The only approach to anything of the sort is the trained man that gets one penny per diem more than the other able seamen for twenty-eight days; that is, two and fourpence per year that the best man can get more than some of his fellows. Many of these men—numbers I may say—hold the ratings from boatswain down in the merchant service, and surely some selection might be made from them to receive ratings in the Royal Naval Reserve. The extra expense would be no great matter compared with the satisfaction it would give the men, and the additional coherence it would give to the force. Jack, like the rest of his kind, likes a little promotion at times; he is proud of the anchor on his cap, which marks the trained man, and would still further appreciate a stripe or two on his arm. There are petty officers in the Naval Artillery Volunteers, but for want of a Lord Brassey's influence in the Naval Reserve it appears always to have been out in the cold.

I should like, whilst on the subject of trained men, to remark that

they have to requalify every year in the first week of their drill, if possible. Having done so, they are in a great measure employed about the drill ships at the lighter duties, falling in sometimes when men are wanted, or for company drill or general quarters always. This being so, their seven days being really a test-drill as in the case of Officers, and the other three weeks virtually given them to enable them to draw their pay, might not one week of that three be given up entirely, on the condition of their serving the rest of the year in a vessel wearing the blue ensign, or in a selected cruizer? I think the advantage of doing so would more than balance the disadvantage; it would keep the men together and help in the work of forming the nucleus of a crew. One other point. It is said on all sides that any future declaration of war will be sudden. Our fleet of mail steamers is scattered over the world, as is our commerce; at the Cape, Australasia, India, China, West Coast of South America; everywhere, in fact,—a very provident arrangement for us too,—if they had arms and the nucleus of a crew in them; but as they are now they are useless, until they can get to a depôt to man and arm.

Quite lately firemen have been enlisted in the Reserve, receiving a yearly retainer of 5*l.*, and doing no drill whatever; whether it would be advisable they should do so, say one week a year, is a question, I think, might be answered in the affirmative. I am under the impression that drill has a humanizing tendency where not carried too far. It is so much education, and here I should like to say that bad as many of our British firemen are, they are not all so by a very great deal; they are, as my experience serves me, capable of behaving themselves (with an occasional break-out in port, but I have only seen one in the last three years), and they keep steam in a very satisfactory manner; the trouble is to get them to realize that they are seamen not in a workshop or factory, but on board ship.

In advocating this scheme for bringing together Officers and men, I have mentioned, as will be seen, only *some* of the largest and best known companies sailing from England. I mention a dozen, and it is capable of considerable extension if necessary; but as nothing but first-rate vessels are usually used for mail services, and they mostly by large and well-established companies, the difficulty of dealing with them would not be excessive. A first-class carrying trade for passengers carries with it its own guarantee for the efficiency of the ships.

Liners.	No. of ships.	To be compulsorily carried.	
		Officers.	Men.
P. and O.	10	20	150
Union Line	6	12	90
Castle Line	6	12	90
West India Mail	6	12	90
Orient	6	12	90
White Star	6	12	90
British India	10	20	90
Cunard	6	12	90
Inman	6	12	90
Pacific	6	12	90
New Zealand	6	12	90
Mail steamers. English Channel	8	8	64
Mail steamers. Irish Channel	8	8	64
Mail steamers. East Coast	10	10	80
Total ships, Officers, and men	100	174	1,258

This list may be called a fairly representative one; one-third of the vessels and men would be within easy reach of, or in the United Kingdom, the remainder of them would be doing service abroad in diffusing information (of which I shall speak later), and otherwise doing as they were wanted, always providing they were able to take care of themselves against ordinary comers. They would be rallying points all over the world to the most remote corner for the Reserve men to gather to, and would be most valuable aids to any of our fighting ships in doing scout work and obtaining information. I do not regard the carrying of their armament as an insurmountable objection. I should not be an advocate for carrying any large supply of ammunition, but the greater part of the armament might be carried closely stowed; and I still think it would be an advantage to have a couple of guns on deck mounted in their places always, at all events on the longer routes; the Atlantic trade would be different. It will doubtless be said such a scheme as this is impracticable; but if there be a need for it, it will have to be carried out somehow; it is summed up in a few words. "Help the merchantmen to look after themselves, and get and impart information for and to our men of war."

With the tactics of the next great naval struggle still undeveloped, and very obscure, there is a vague uncertainty on all hands as to the lines such a combat will take; but never, I think it will be conceded, has the doctrine of "Forewarned is forearmed" been of greater importance. With means of communication so rapid, that people on one side of the globe are acquainted with facts which have happened at the other side, at a date which is still future to them, it is a matter

of speculation to imagine what would be the result of a day's lost intelligence at a critical time, or the start that a week of no intelligence would give to a well-prepared enemy—to make one comparison—is there any doubt at the present moment that if one of the Continental nations now armed to the teeth could gain a day's clear start, it would omit to use it to the disadvantage of its rival? By the same reasoning could our submarine cables once be blocked or cut for a week, what would be the result on our Colonies, dependencies, and merchant vessels? I could not attempt to show how this evil is to be remedied, but shall confine my remarks to a small measure of organization, which, if adopted in peace-time, would considerably minimize this, to us, element of destruction.

As the manner of communication would be the same all the world over, save that different rendezvous would be appointed, I shall limit my remarks to the routes best known to myself, and even then sketching only the broad outlines of a plan that, from the standpoint of the shipowner, would possess few objections and no hindrance to the all-important work of earning the £ *s. d.* I am the more encouraged to do so when I see the start that has been made in the way of subsidizing vessels for mail steamers that have places on the Admiralty List, and the apparent willingness on the part of their owners to meet the wishes of the Imperial Government. I think the experiences of all Officers engaged in the late trooping arrangements will bear me out when I say that the tendency is generally to endeavour to give satisfaction to the Government when employed, and to be very thankful for anything like a Government contract. John Bull is usually a liberal taskmaster.

On the Cape of Good Hope route—and it is needless to mention the immense traffic there is even now homeward from that point—I mark this spot on the map as one that all mail steamers should pass over both homeward and outward bound except when calling at St. Helena, and under ordinary circumstances the time of their passing it could be well fixed to, say, six hours. In so doing I assume an average speed of thirteen knots, and when I say that the same points are passed voyage after voyage within an hour or so of the same time, I am not guilty of exaggeration, and the thing is well within the ordinary scope of modern navigation. Sir William Thomson's compass has proved so great a success, that with it it is quite possible in water where no great current exists to be within 5 miles of a dead reckoning position at the end of a twenty-four hours' run, and this greater accuracy of navigation renders it as easy to find a look-out vessel at a certain rendezvous as it is to pick up land or a light-house.

Now, suppose that by last advices by cable the Admiral on the Cape station is informed that war is imminent, or perhaps will be declared on a certain date, when suddenly there is a break in the communication, and the cable has been cut somewhere between Zanzibar and Aden, and again between Mozambique and Delagoa Bay. Probably the Admiral on the Indian station might despatch a fast vessel to Natal with the intelligence that war was declared, but what

happens in the meantime? For the space of ten days, roughly speaking, all traffic in our ships round the Cape is going as rapidly as it can to its destruction on the line where our enemies would be cruizing to intercept it. On the other hand, let us suppose the Cape mail steamer leaves Lisbon or Madeira with the news that war is declared by France,—say for argument,—she knows perfectly well that she has to pass Goree and the French men-of-war in the probable vicinity, but that is a matter of little moment, as having more speed than an ordinary war vessel, she picks her own route until a time when she hauls into a track which shall take her over a certain line. A point, say, lat. 8° S., long. 3° W., which shall be extended 40 miles each way in a N. 38° W. and S. 38° E. direction. There is little current there to put a ship out of position, and sights are nearly always obtainable in that latitude both night and day; she should know that under the conditions there would be a vessel there waiting for news, this vessel would have been despatched from the Cape immediately on the supposed outbreak of war or interruption of intelligence to cruize on the arranged rendezvous, and her instructions would be something after the following: "If on meeting the mail steamer you find that war is declared by or against Great Britain, you will immediately proceed in a W.S.W. (true) direction until arriving in the track of homeward bound vessels; you will instruct them, instead of attempting to cross the Line, to haul their wind and proceed to Rio de Janeiro (say), where a convoy will be formed to protect them home; after having cruized for fourteen days across the track, you will return to the Cape by the ordinary route of sailing vessels, taking every care to warn vessels you may meet by the way." By making Rio a place of refuge for vessels, they would have the S.E. Trade on their beam, the best point of sailing, and Rio harbour is perfectly secure in every way, there being a number of very potent arguments against any infringement of the Law of Nations.

The rendezvous here mentioned in 8° S., 3° W., is eight days from Madeira and six from the Cape; by the time the vessel despatched from that port had been four days on her cruizing ground in the track of vessels, the mail steamer would have arrived at the Cape, or perhaps information would have reached there from the East Coast, and other vessels would have been sent out to warn the homeward-bounders off Agulhas to make for Table or Simon's Bays, until such time as convoys could be formed to protect them on their homeward route.

On the other hand, if nothing of this sort were done, a fortnight's traffic round the Cape would have drifted up, say, to St. Paul's Rocks as a crossing place, and been probably captured and burned. It will be an absolute duty on the part of the British Government to give warning to vessels at sea, if we are again engaged in naval warfare, but unless some scheme such as this is organized during peace-time, and masters of vessels on the long sea voyages familiarized with giving and receiving information, we shall hardly spare ourselves the spectacle of the line illuminated by the flames of our burning merchantmen.

It may be said that having these points fixed is likely to be a bait to an enemy's cruizers; that may be so, but it does not follow that the same spot should always be selected for a rendezvous, it might be varied for each month of the year, and our own cruizers would know exactly how it varied. The spot now mentioned only requires to be glanced at to understand how thence news could be disseminated to the West Coast of Africa and the Atlantic islands. In the case of the outward-bound vessel calling at St. Helena, she might do it after she had made her communication, or as otherwise arranged for an emergency. As I said before, this is only a broad outline which would require much filling in, but some similar measure would have to be taken to secure the safety of the San Francisco wheat ships and vessels bound home round Cape Horn. Here the Falkland Islands being British possessions no trouble should be experienced. A fast steamer cruizing to and fro from Cape Pembroke E.S.E. 60 miles would pick up the majority of both steamers and sailing vessels, but there would also, I think, be necessity for another in the latitude of Trinidad Island to intercept stragglers bound either way.

In furtherance of this same object of intelligence-giving, I think that all subsidized lines and mail steamers should be compelled at all times to follow certain hard and fast lines at certain points of their route, and to do it in an unvarying fashion. These sections of routes could be arranged for each month or quarter between the Admiralty and the Post Office officials with the owners of the vessels, and it is needless to point out the advantage it would be to our own men-of-war when away from telegraphic intelligence, to be able to intercept our mail steamers with certainty, say, when engaged in patrolling one of our lines of commerce; but before this can be properly worked out there must be an arrangement of signals come to, which will be very widely different from anything we have in existence at present. Now, if a merchant vessel sighted in unsettled times another vessel that she was doubtful about, away she would go, with the other perhaps in chase, whether friend or enemy; after, say, a day or half a day, the chase ends either one way or the other, and if they are friends it might well come under the heading of Whyte-Melville's very beautiful chapter on "Waste"—waste of time, coal, and perhaps temper, for it might well be provided against, instead of leaving it in the blessed state of uncertainty which now prevails.

Naval Officers are naturally jealous of private signals, and until very recently of having anything in common with the merchant service, but now that the merchant auxiliary has found its way into the Navy List, it may be as well to make the best of the business, and try how much good can be obtained from it. In other words, having once admitted that these steamers are useful, to get the greatest amount possible of good work from them. I do not for one instant advocate that the private signals of the Navy itself should be brought into use, or placed in the hands of the Commander of any vessel not wearing the White Ensign, and I hope no one will credit me with the idea, but a special code might be established for use between vessels of the Royal Navy and Royal Naval Reserve, I say ships of the Royal

Naval Reserve, because I look forward to a time not, I hope, far distant, when all our over-sea mail steamers will come under that head, and the sooner the better, I think.

These signal books might be of two descriptions, the one to be used at once, to accustom both men-of-war and mail steamers to communicate; the other to be a sealed book, issued to the Commanders of vessels on *certain routes* only. These latter books should be numbered and issued only through the Registrar-General of Seamen *himself*, or through an Admiralty official, equally responsible to the Officer in command.

The books should be frequently called in, in the United Kingdom, and different sets issued. Each set might run for three or six months; and men-of-war only on foreign stations should have them all, and receive the key to the set in use by telegram.

Any Officer breaking the seal of one of these books should be subject to an investigation of his conduct, unless he could show that he considered himself justified in doing so, and the matter of inquiry *alone* would be quite sufficient to keep seals intact until the time came to break them. When this time arrived, it should be done in the presence of the two senior Officers of the ship, and the facts of the case noted in the log book, and attested as usual in the case of important events on shipboard. By so doing the chances of their falling into an enemy's hand would be small; the destruction of the signal book in case of capture could I trust be well left to the loyalty of the Officer holding possession.

These signals would have to be in the first place distant signals; by daylight in clear weather it should be possible to communicate easily at 12 miles, and of the many systems in use, by sails or yards (to take the place of semaphore arms) or canvas shapes, it is not necessary to express an opinion here as to which is the more advisable. I would only advocate the most *extreme simplicity* for urgent signals; but if once the principle be conceded, the details will follow as a matter of course, without any trouble. I may say, however, that I think large canvas shapes will be indispensable for effective distant signalling (as apart from an urgent signal), and the cone, drum, cross, and diamond would probably play their part in any system brought into use.

On the other hand, night and sound signals are capable of very great expansion. It is an easy matter now to recognize any liner by her night signals, but in war-time it would be necessary to carefully stop any method by which well known lines communicate with one another. On a previous occasion I have mentioned the grave inconvenience and uncertainty of being at sea in unsettled times for twenty days without information, and it might well be incorporated with or in these signals, the spot over which vessels without information should pass, that in the event of war they should receive timely notice in a certain amount of security; the said information need not be necessarily imparted by a man-of-war, but it would be distinctly valuable if the whereabouts of a powerful cruizer could be imparted

to a merchant vessel possessed of valuable information as to an enemy's movements.

There is a very important question to be settled in the next naval war, and it is so intimately connected with the merchant service primarily, that I do not think it would be out of place to make some allusion to it here. I do not think I should be very far wrong if I called it a vital question, and yet it is only one of those important simplicities which may settle the fate of the next great naval action, I mean the supply of coal to men-of-war at sea or in an open anchorage, or for that matter wherever men-of-war may happen to be with their supply ships. I have read with very great interest two papers read at this Institution on the subject, and to my mind both systems are open to serious objection as a first method, for the following reasons.

If the weather or sea be quiet enough to permit vessels to be taken in tow, and masthead hawsers rigged, it is fine enough to do the work by lighters or boats. If on the other hand the weather be too bad to rig hawsers, it may still be fine enough to get through the work by bags and boats. I base this assertion on the following reasons:—I was once towed from Ascension to England, and experienced the extreme difficulty of maintaining a safe distance between two large ships at close quarters in a seaway, and the very large and long experience I have had in working cargo with lighters on the South African Coast. On that coast, which is in close proximity to the so-called Cape of Storms, it will hardly be believed how bad the weather may be, and yet the work goes on uninterruptedly. I therefore venture to put forward the suggestion that effective coaling at sea must be done with large boats and bags.

Now I am aware that the idea of employing the largest boats of a man-of-war would find little favour; they have to be kept in such a state of efficiency, that even a temporary use of them for this purpose would seriously impair it; the boats carried by merchantmen are also unfit, both as to size and capacity, but a naval war while it lasts may be very warm work, and yet not be very lasting. That being assumed, I think the difficulty could be met very fairly by the employment of large Berthon boats; every coal storeship attached to a fleet might well carry a dozen, say thirty feet by ten or eleven. These boats, specially constructed with vertical rubbing pieces, or still better, a light steel shield, to protect the side, would carry from fifteen to twenty tons easily in anything like moderate weather, and it does not follow that coaling is always to be done in a gale of wind. I am not speaking now theoretically, but from actual practice. The boats in themselves have rather too much buoyancy, and therefore lend an especial aid to the work under consideration. I can say that I have seen them do very good work in transhipping cargo, &c., and their extreme portability and handiness for stowage is all in their favour. They should be fitted with or carry good coir boat ropes which have very great elasticity.

Coal ships for this purpose should be supplied with bags to hold two hundred weight; these bags, properly roped, and becketed, are

very easily manipulated and hoisted, in or out, five at a time. With hooks at the end of a whip (one hook, one bag) it is surprising the amount of work that can be done with them. With a fair supply of bags on board colliers they can be filled and tied at sea when there is nothing else doing, and within an hour from the order being given to commence coaling, the work might be in full swing, working four gangways. I cannot but think effective coaling will have to be done in this manner.

I see by the Navy List that a number of the largest and fastest steamers sailing from British ports have been permanently retained for Government service. I regard it with great satisfaction, and yet with a feeling of uneasiness that a good scheme is likely to meet with disaster through being imperfectly worked. I am afraid that the opinion held so largely in naval circles as to the uselessness of the merchant steamer as a fighting machine will receive a certain amount of confirmation if these very long vessels are to be the armed mercantile cruizers of the future. The ships themselves are perhaps the finest in the world, but, to use an expression I have heard applied to a mail steamer in this theatre, if to be a "long ghost of misery" is a misfortune, why prolong or elongate the said poor ghost by a hundred feet or more beyond its necessary length. These vessels in question have undoubtedly the speed to decline an action, but if forced into one against their wish their manœuvring power would, against a shorter vessel, be almost *nil*. I doubt if either of them could steam a circle at full speed in less than twenty minutes, added to which they are too big entirely, save as transports, store, or hospital ships, or look-out vessels. They offer a target to shoot at which could not be missed, but would be riddled from end to end, and the damage would be spread over such an area as to offer the least chance of repairing. Mere speed in a contest between two armed merchantmen would not mean everything; it would of course provide escape, but that is not the requirement in this case; and although the ram in a man-of-war is a very dangerous instrument, both for the rammer and the rammee, the same remark hardly applies to a merchant vessel's stem when used for that purpose. I draw the inference that if two of these vessels were opposed to one another, given sea room, the shorter one, if there is any decided difference in length, is practically safe from the ram—pre-supposing there is equally good handling on both sides, and each vessel with only one propeller; and owing to the great space required to turn, if a long fast ship were coming up astern of a slower, shorter one, with intent to damage her propeller or rudder, the shorter one could escape the longer, and very possibly administer also an effective ram below.

The only vessels afloat to my knowledge that would need these "Umbrias" and "Etrurias" to catch them are the North German Lloyd steamers, and they are not probable antagonists. The French Messageries Maritimes are not nearly so fast or nearly so large, but they are comparatively handy vessels, are officered now by naval Officers, and, I am informed, but I cannot vouch for the accuracy of my information, though I believe it, carry their armament carefully

stowed away on board, but quite handy to get at. It appears somewhat curious also that these vessels should have privileges in our own ports which are denied to our own mail steamers.

The late naval manœuvres have shown, however, the absolute necessity of a Commander-in-Chief having at his disposal the very fastest vessels for look-out men, and here the advantage of great length comes in, by being able to maintain a big speed against any weather. I do not know that it is fair to expect a man-of-war to be an express boat for long distances, certainly a few fast merchantmen in the last manœuvres could have patrolled the Channel from end to end with the greatest ease, and given ample warning and information as to the movements of an enemy's ironclads, and I suppose we may take the late movements as a fair criterion of the present condition of naval warfare. Again these vessels in clear weather could always give two hours' notice of the approach of almost any fighting ships afloat, but the armed mercantile cruizer should, I think, be chosen from the list of vessels at the utmost 390 feet long, and there are numbers of vessels not even that length that would answer the purpose admirably.

In the foregoing remarks I have not aimed at anything like detail, I have purposely avoided anything of the sort, my object has merely been to point out the broad outlines of a scheme such as would be well within the limits of our ordinary everyday work, and to urge the necessity of acquainting each and all of our shipmasters that a certain scheme for the preservation of our merchant fleet from an enemy is in existence, and so quicken their perceptions, that if suddenly informed of a war, and they recommended to proceed to a place of safety, they would be enabled to weigh in their own minds the probability of its being a ruse of the enemy or an arrangement made for their safety. They being men used for the most part to look at all sides of a question would adopt means to satisfy themselves as to the vessel giving information, and in the majority of cases arrive at a right conclusion. I do not say who is to bear the cost of these warning vessels, but they should most assuredly be dispatched by the Admirals commanding stations, and arrangements made with owners and insurance companies either before or after the necessity arises for their despatch. I cannot too clearly express my opinion as a merchantman, that unless some scheme such as this be taken in hand, on the sudden outbreak of war there will be such a destruction of property as can hardly be imagined, and it will be little use trying to formulate any such idea at the last moment; all vessels bound over sea should be aware of the existence of the plan, and the issue left to the good sound sense that has made England the greatest Power in the world.

I have been encouraged to make many of these remarks by the good reception given to a former paper, and the formed conviction thereby, that many of these subjects, interesting in a way to everyone connected with the Navy, are more especially understood and thought over by the people more immediately concerned. I, being a merchantman first, and more or less an amateur as a naval Officer, naturally

think most about merchant vessels and how to use them; not least also should I like to help to get in the thin end of the wedge for the organization of our merchant fleet, and I shall be well pleased if this paper draws a little attention to the ease with which steps may be taken to protect our commerce, and the vital necessity there is for inaugurating measures for that purpose at once.

Captain J. C. R. Colomb, M.P.: I think it is a most valuable thing that a gentleman competent to speak upon this subject from the mercantile marine point of view has given us this lecture, for I am sure in dealing with the protection of our commerce, there is nothing so valuable to us as the views of those who are engaged in carrying it on during time of peace. I can only say that I wish we had these views a little oftener expressed in this Institution, because after all, when we come to think of it, upon the Navy primarily will rest the protection of that commerce; and we all know, pressed as the Navy is to fulfil the ordinary duties of peace, that they have not that opportunity which is, I think, necessary for their education, of being brought into contact with the views of the representatives of that commerce which they will have to protect in war. I must say, speaking from the general point of view, I have read this paper with the deepest interest. I am very pleased to observe some salient principles running through it that I have some time ago defined and long wished to hear debated and discussed by representatives of the commerce of the country. One of these main principles touched upon is a pre-arranged system for the variation of route of our commerce, and the power that steam gives you to vary your routes. I have always considered that that is the principle on which arrangements for the safety of your commerce should be based. I ventured myself to put that view forward in this Institution some years ago, and I am delighted to find that the lecturer has adopted it to-day. There are just two or three other points in the paper on which I may offer one or two remarks. In the first place, remembering that our commerce is in two departments, the sailing and the steam, and that the sailing is the diminishing one, we can only consider the protection of the sailing commerce from a temporary point of view; that is not that you will have to arrange during a war for a long-continued protection of your sailing commerce, although you must be prepared to deal with its protection on the outbreak of war when it is actually at sea, because I think the whole tendency must be that the sailing commerce will not in war get freight. That affects the routes: the shutting up of your sailing trade affects the routes that you will have to guard. But on the other hand, there is a medium stage for any steamers that cannot take the direct course of the great steamers, and consequently your route will be a sort of compromise in many cases between the direct steam route and the old sailing route. The power of varying your commercial routes is therefore limited. That will determine the distribution of your naval force, and the lecturer indicates that view. I doubt myself whether one of the needs of the Navy, if I understand him to mean the Royal Navy, will be men. I think the difficulty and needs of the Royal Navy in war will be to get ships, and I think, therefore, that that assumption on the part of the lecturer requires very careful consideration before it is accepted. I entirely agree with the view that the mail contracts given to steamers should carry some conditions with them with regard to their defensive obligations in case of war, and I think we are doing immense mischief by adopting the mail contract principle in peace without inserting those conditions, and, if I am correctly informed, we are the only nation that gives postal contracts to vessels and make no such conditions. With regard to the depôt for arming and manning your merchant ships, that is a matter I have strongly urged for very many years. In order to shorten the whole question, which is really a very large one indeed, I think that we want to deal more with companies and big and organized groups of ships in making our arrangements than with individual ships. That, as I understand, is also indicated in this lecture, but here you are met by one great consideration. As it appears to me, the quarter from whence war comes will vary the operations of your ships. A European war would throw none of your ocean-going steamers out of trade, but an American war

would throw the greater number of the steamers engaged in the carrying trade across the ocean out of work. Therefore an American war would place actually at the disposal of this country the best of the mercantile marine; a European war would not. I entirely agree with the view laid down by the lecturer, that you should deal with the steam lines connecting your Empire on an Imperial principle. I know the Chairman will not agree with me, still one always likes to stick to one's guns. I think the principle adopted of arranging to take your fastest steamers off your Imperial lines in war is a most dangerous one, and one that will be found so in actual war. It is because you have not approached the question as a whole that you have got into that muddle, and therefore I trust that such broad views as the lecturer has brought forward will be considered, because it is only by dealing with broad principles that you ever get satisfactory detail.

Lieutenant W. Baden-Powell, R.N.R.: I wish to make one or two remarks on this subject, because having given some consideration to it, I at the present moment look upon it as a question of the first importance to this country; not only as a maritime country, but as a country full of human beings that must live. We all know that war is declared at the present day at a moment's notice, can be declared at a moment's notice, and we know also that the great food supply of this country is water-borne, and that the country itself cannot really supply one-eighth of the people living in it. The question would be then, on war being declared, how are we to keep that supply constantly coming into the country? It has been assumed—and I think without good reason, by most speakers and writers on naval policy—that a naval war will be sudden, short and sharp. I should say most naval men will agree that a naval war may be the most prolonged of any war. It would probably become a blockading war. The first thing that naval men would like to see would be the ships of the other nation out at sea, and to have a chance at them; but I believe we should find, as was the case in the Franco-Prussian War, that they would play hide and seek in their own ports. That being so, it seems to me that the lecturer is perfectly right when he says that "a good scheme is on the chance of being lost by not being properly carried out." And it seems to me that this scheme really does not receive the attention of the country that it ought to receive, when you notice that in the scheme for the Naval Estimates about to be produced in the House of Commons the subject of armed merchant steamers occupies scarcely the space of 3½ lines in several columns of matter. Then we go a little further: the lecturer has pointed out that the ships, in his opinion, are not fit for the purpose for which they are being retained; that is, assuming they are being retained as fighting ships. I do not know myself what the Government scheme may be as to retaining merchantmen to be armed in time of war, but it seems to me that they are to be retained for fighting purposes; if, however, they are to be armed and simply keep on their work armed as mercantile cruizers, there will be very little harm in that, provided they can get over the question of international law with regard to the Declaration of Paris. But the real work to which they can be best put for the purposes of the country would be scouting work; and then only the fastest and handiest ships such as are now constructed on the Clyde, at Liverpool, at Barrow, and Belfast, twin-screw ships giving a speed of 18 or 19 knots, should really be used. I do not doubt that in a naval war we could get vessels from every part of the country of all sorts, fitted either to carry coal or stores, or to fight. I do not doubt that for a moment; but I do maintain that the difficulty is the men. Captain Colomb pointed out just now that manning was not the difficulty for the Navy, but I should like to know in case of a European naval war where we should get the men from, to man the Service. In the old days we had treble the number of men on every merchant ship at sea that we have now. Our merchant ships carry 14 or 15 men, where they used to carry 40 or 50. They have so much steam power to do all the work. Since I have left the sea I have been at work in the Admiralty Court, and there we have collisions and salvage cases nearly every day, and the crews of British ships that come before us in nine cases out of ten are largely composed of foreigners. We have even Officers holding certificates as captains and mates of British ships who are Swedes, Danes, Germans, and others; some hardly capable of speaking English. Where will these men go in war-time? They will clear out of the

country, of course, and where should we then draw our men from for the Navy? Of course the Naval Reserve would have to be taken out of the merchant ships under the present system of reserve, and how are the merchant ships then going to be manned, so as to continue to carry that food which the country must have? It is a most difficult problem, and one that ought to be faced at once, and carefully faced. There was the question of patrolling the seas. I can only say I should like to see that patrolling the seas known to every nation, for if the enemy would only bring their fast cruizers to the patrolling stations, it would give us some chance of getting hold of them. In the case of the "Alabama," the difficulty of Captain Semmes' enemies was to find him; he cruized here, there, and everywhere, like a Spring-heeled Jack, and was never to be caught. As to the men of the Naval Reserve, my opinion is this, that men ought not to be drilled on these old drill-ships at docks and out-of-the-way places, where they are allowed to come in in comparatively slovenly order, but they ought to be sent on board men-of-war, in order to get a slight dose of discipline, and of Jack's cleanly habits on board a proper ship. I have seen hundreds of Naval Reserve men, good cleanly men, too—they put on a guernsey, and wear a paper collar over it—the sort of men that would take about half a month of Sundays to get up a forecastle ladder. These are the men you should work up on men-of-war, and then let them go back to the merchant service, and like decoy ducks they will bring in the other men. There is one other thing we ought to be seriously inquiring into, and I hope that some day the House of Commons will take the matter up, viz., the disgraceful state of the Naval Reserve List. If that is all the number of Officers and men that we can get, there must be something radically wrong. I think the great difficulty is the relation between the merchant officer and the merchant man and his owner. We cannot expect a shipowner who has to make his money by his ship to employ a man who may at a moment's notice be taken away from him, and you cannot expect a man to come and join the Naval Reserve when he knows that it may be the bar to his getting a ship. A man goes to an owner and says, "I should like to serve in your ship." "Are you a Naval Reserve Officer?" "Yes." "Oh, that will never do, you will be wanting to get away to drill, or you may be taken away at a moment's notice." And besides that, no doubt some of these foreign gentlemen do without grumbling, harder work and for less pay. What we want is to make the Naval Reserve as large a body as possible, and it may be done in a most inexpensive way. It seems to me that a little more promotion, a little better pay, better chance of study for Officers, a few cruizes in men-of-war, especially in small craft, so that the men may not be bothered with the routine of an unwieldy turret-ship, would make it a success. Then as to the Declaration of Paris: I do not wish to go into that, but the lecturer has truly said that the old fighting clause, I think it was in Charles II's reign, has been done away with. But I believe it to be absolutely illegal for a man at the present day to be caught armed on the ocean. He is liable to be treated as a pirate. Therefore I think the sooner that Declaration of Paris is reconsidered the better. I have been told by very high authorities that it is an illegal document; that the noble lords who signed it signed it without authority, and exceeded their authority. That may be so, but in time of war, when you get caught on a foreign station on the other side of the world by a foreign cruizer, they don't wait to know anything about the Declaration of Paris being legal or illegal; they would have you up quick. These things ought to be settled in time of peace, and all doubts removed; and when could England, looking at the present state of the Continent, find a better opportunity to go boldly to the other countries of Europe and say, "Let us consider the Declaration of Paris, and see whether it is legal or illegal;" and, I should say, cut out the clauses about privateering, or remodel the clauses so as to include and legalize the armed mercantile ships as an auxiliary navy. We are the best privateers; other countries who did not join the Declaration of Paris are all able to fit out privateers, and would not they give us some? When I see Royal Commission after Royal Commission sitting on such questions as "Saving Life at Sea," considering third class passengers, and all those sorts of things, such as whether they ought to have a life-belt each, and to be instructed how to wear it, I ask why should not we have a Royal Commission properly constituted with efficient men to look into this subject of utilizing the merchantmen, and keeping our country's food supply safe

in time of war. It would be our most vulnerable point; it would be our duty to protect the merchant service, and we cannot do it without our Navy. I say it would be putting an expense on the country at the moment when it would not be ready to undertake that expense, and certainly it would be incapable of providing ships at the last minute. These questions are of such magnitude that they cannot be dealt with here; but as I say, they are a subject fit for a Royal Commission, or at any rate for careful consideration by both Houses of Parliament.

Admiral SCOTT: The subject before us is really, as has been said, very important; it touches us in so many directions. I think, however, we are mostly agreed, that if the best men are taken out of our mercantile marine in time of war, we shall at once do what the enemy would like us to do, namely, destroy our own commerce. Unless these men, who are the very pith and marrow of the merchant service, are retained, there will be but little hope of securing the continuance of our supplies. I see no reason against our merchant vessels being armed at once. Why should we not utilize the whole of our resources just as other nations are utilizing theirs? We are utilizing these resources as regards the volunteers; and other nations are enrolling their able-bodied men, and utilizing them as a reserve. Why then are we to be bound down, and not to use every power that has been put into our hands? It seems to me to be foolish not to do so. The Declaration of Paris, about which a good deal has been said, was *for the abolition of privateering*. Our merchant vessels going about their legitimate work are not privateers, and surely their crews should be allowed to strike in their own defence. They would when armed be a purely defensive force, and are the crews to allow their vessels to be burnt, or themselves carried into captivity, without striking a blow? Give these men the weapons and the opportunity, and I suspect they would render a very good account of themselves. As to the preparations we have already made by sending guns to different parts abroad, it seems to me that in the first place the guns are unsuitable; and in the second place that the greater part of the war would be over before they were mounted. Another mistake is that of putting naval Officers in command of merchant vessels and displacing their Officers, who are fully acquainted with them, on war breaking out. With respect to the value of our mercantile marine as an auxiliary in warfare, merchant ships are far less powerful than men-of-war; but merchant ships can, as in times past, perform very excellent services. Our East Indiamen used to fight their own way; but let us look for a moment at what they are now doing in the west of England to commemorate the Tercentenary of the Armada's defeat. Let that great action remind us that merchant vessels will stand a great deal more hammering than is generally supposed. I think it is only a modern fallacy that they would be sunk at once. If you look at the pictures of former actions, you will see vessels with great holes in them, such as the "Sanspareil" and other ships which withstood a very great deal of hammering at Sebastopol; and in like manner our paddle war steamers were riddled in the River Plate, but were still serviceable. Look at the national importance of arming our merchant vessels. We could then, instead of taking the men away from their work to drill them in harbour, carry these men to sea, and teach them afloat the use of the guns in their own vessels. You would thus secure a large armed force in all parts of the world, and wherever our vessels voyaged there would be found a very considerable body of trained men. And more than that, we should also secure a real reserve for the Royal Navy, for very soon after war was declared our sailing ships would be laid up, and these men would flow into the Service. I have had much experience in drilling seamen, and as an old Gunnery Officer I know well that if you teach men properly you will soon find they are quick enough. The slow and stupid way in which seamen are sometimes drilled is enough to dull any men's senses. Nor do seamen require the long drills that are often talked of as necessary. We can have very simple guns mounted, and such weapons can be the most efficiently handled; whatever is complicated is sure to fail in war, and therefore simplicity is required in our weapons. But the main requisite is trained men, and if we have trained men in the mercantile steamers, we shall possess an armed force which will materially strengthen our commercial defences; and these men would soon draw into the same national force our seafaring population. But not only should we seek to enrol the seafaring population of England, but also that of our Colonies, and then what a

large national volunteer force we should have! I do not speak without experience in this matter, for in one of our Colonies, New Zealand, I had an opportunity of drawing seamen together and organizing a squadron for a sham attack on Camaru. The whole of the men were delighted with their work, and readily gave up their time and pay for four or five days together to carry on these operations. Seeing then what has been done in New Zealand, are, I ask, our seamen here less patriotic? I am quite sure if they were properly encouraged and taken by the hand, we should have ere long a very large number of trained men. And with respect to the Officers, they likewise want encouragement, and ought to have a like chance of rising in rank. I believe it would be an excellent thing if we abolished one-third of the entry into the Royal Navy, and took more Officers from the merchant service in war time; this course would knit the two services more closely together, and would also allow of far quicker promotion to be given to our own Officers during peace. Our nation has been given the command of the sea, it is our highway and means of communication with all parts of our Empire. We have much trade at the different ports, and hold the keys of the ocean routes in our hands; and if we cannot utilize our large naval and mercantile marine so as to preserve these routes, I think our nation must be in a very bad state indeed. I think, however, that we should bear in mind that the present opposition to each of the two great Powers is of enormous advantage to us; but supposing these two Powers or others should unite against us, do you not suppose that they would be very glad, if they could do so, to lay hold of our commerce? Have we not had a little experience of how readily two Powers could unite in the cutting off a portion of Denmark? And how easily, did we not make adequate preparations, could our own commerce be injured. This is a matter which requires very careful looking into, and is not one which can be settled by any individual opinion, but is a question that really requires a Royal Commission to go into the whole matter; and I am quite sure it would be found that we have in the mercantile marine[1] and in our seafaring population a force which very few people have as yet realized the full defensive value of.

Rear-Admiral COLOMB: The general impression I have gained from hearing this paper read is, adopting the words of the lecturer himself, that if the mercantile marine is to produce many specimens such as we have before us in the person of the lecturer, we should certainly encourage the mercantile marine to look after itself, for it will do its work right well. We have heard a most excellent paper, a paper that deserves a great deal of thinking over. There is one point adverted to which has been a belief of mine for some time, and that is, that the greater part of the preying on our mercantile marine must be done by armed merchant ships. As the lecturer says there are not enough men-of-war anywhere to prey heavily on our mercantile marine, but all the experience of former wars tells us that the armed merchant ship when it was in the form of a privateer did the worst of the work on our ships. And now that she will be in the form of a raider, I think it will be the same case, and therefore I think there is a great deal in what the lecturer has said in pointing out that the merchant ship herself, properly armed and encouraged, will be able to do a great deal of the repelling of the raider without the necessity of appealing to a man-of-war at all. As to the Declaration of Paris and the abolition of privateering there is one thing we quite forget. The abolition of privateering is all for the bad and not for the good in any way, because the privateer in old times could not destroy. The privateer must carry his prize into port, and she must be condemned in regular course—he could not destroy her, he could not hurt her in any way, he could only take her into port. If she was recaptured

[1] An Imperial naval volunteer force afloat would have great advantages over the land volunteer force, for it would not require to be taken away from its usual avocations for drill or warfare, but would be always ready for service, and without requiring the cost of ammunition depôts, drill sheds, nor other outlay essential to the efficiency of our fine volunteer army. Raids upon commercial ports would be hopeless with guns and drilled marksmen in every merchant vessel, and until such is carried out, the fortifying of coaling stations will add but little to our mercantile safety, or to forwarding that close union in federation upon which the future prosperity of our Empire depends.—R. S.

there was an end of it. The Federals called the "Alabama" a privateer, but she was not a privateer at all, inasmuch as she had powers of destruction which were never granted to any privateer. That is a point that ought to be thoroughly well dwelt upon in relation to the Declaration of Paris. The lecturer holds that the object is to bring Officers and men of the reserves together, and also I think to bring the Officers and men and the ships together. That is a thing that we are now doing almost for the first time in the Royal Navy—for the first time within the last forty or fifty years; we are adapting our personnel to our matériel, bringing the two together, and making the one govern the other. I must say I think there is a great deal of force in what the lecturer has said with regard to the subvention of steamers, because I presume he must apply his remarks principally to those. We ought in dealing with those steamers to see that we have the crews belonging to them, and that we get the crews with them when they are taken up for war. It was the old practice. The old hired armed merchant ship was hired, Officers and men together. She was not a hired ship manned from the Navy, she was a ship which had her crew and Officers all hired together. I was very much surprised at Mr. Baden-Powell's remark as to the law in reference to merchant ships protecting themselves. It was stated by Lord Thring in this Institution not very long ago that every merchant ship had a perfect right to arm herself, and that any merchant ship was perfectly justified in using any amount of force to prevent herself from being robbed. I cannot help thinking, whatever may be said, that that must be so still. No Englishmen has a right to allow himself to be robbed if he can fight for it, and, therefore, I think no English ship either has a right to allow herself to be robbed if she can fight for it. The difficulty in officering H.M.'s ships from the mercantile marine is unquestionably the training. At the present moment, both with regard to Officers and men of the Royal Naval Reserve, I do not think we are quite clear as to what we are going to do with them. We are taking a certain number of Officers of the Reserve on board our ships, and placing them on the same level as the other Officers for the purpose of training them for a year in the ways of men-of-war. That points towards bringing the Officers of the Naval Reserve on board our ships to supply the known want (but not the admitted want), the known want of a sufficient number of Officers in the Royal Navy. But the lecturer certainly takes a somewhat different line, because he contemplates the officering and manning of the subventioned ships by the men of the Reserve and Officers of the Reserve, and so far I must say I feel myself much with him. He amused me a little—I was not aware of it—by showing that our old friend the sail turns up again in a very unexpected quarter. As far as I understand him, the Officers of the Royal Naval Reserves brought up in sailing ships have a certain advantage over those who have been brought up in steamers. I think my friend Captain Fitzgerald may have a shot at that presently. I was very glad to hear the lecturer speak so highly of drill as an education. There cannot be a doubt about it, no man that ever lived is the worse for being drilled. The practical way in which the lecturer has looked at this question, the way in which he has dealt with the sort of attacks that are likely to be made, with the sort of contingencies that are to be prepared for war, is what we do not often meet with in this Institution. I am sorry to say that in the theatre of this Institution it is much more usual to suppose that the forces that are going to attack us are coming from the moon. The question of private signals is also one which has engaged a good deal of my attention, and I am glad to note the lecturer's remarks upon it. One of the possibilities of attack upon merchant ships in war is that they will not be able to tell friend from enemy on approach. In old days you knew a Frenchman by his rig: if you saw him 10 miles off you knew he was a foe of some kind; but now that the mass of steamers are built in England they are all nearly of one pattern, and you will never be able to tell whether a steamer coming towards you is an enemy or a friend. Unless you have a good system of private signals I think our ships will often be caught napping. There was a little confusion between Captain Colomb and Mr. Baden-Powell as to the manning question. I understood Captain Colomb to say it was the question of manning the Mercantile Marine, while Mr. Baden-Powell thought he referred to the question of manning the Navy. Now I do not agree that for the ships we have got now in the Royal Navy we want men. As far as I can make out, we have

plenty of men, but as Mr. Baden-Powell pointed out here, you have a large number of foreigners, and where you propose to draw a certain number of the best men away from the mercantile marine, I think it is quite possible the manning of the mercantile marine in war may be a very difficult and critical business, and it is one which I am glad has been brought forward. There is one further remark I have to make in reference to what will happen in the case of war in regard to sailing ships. Only the day before yesterday I was looking into the question in British ships of the relative tonnage registered of the steam and sailing mercantile navy. The sailing navy is as 3¼ to 4 of the steam. I had always supposed the sailing ships must go, we could not possibly maintain them free to do their business on the sea; but when I come to think how the 3¼ is to get into the 4, that is to say how the steamers are to carry 7¼ when they now only carry 4, it begins to show me that that question is not so clear as I had been in the habit of thinking. It seems possible that we may not be able to drop the sailing commerce, and we shall have to put forward exertions for its protection which we have not yet dreamt of.[1] The point which strikes me most forcibly of all in this lecture is the way it follows on the statements of the two Ministers who are responsible for the defences of this country. My own impression from many many years' consideration, now becoming doubly strong the deeper I go into the question, is that the great danger, the only danger that this country is open to, is the destruction of its commerce. I cannot think that there is any danger at all commensurate with it. But if we regard the statements of the two Ministers, such a fear appears to be almost absent from their minds. There is one slight reference in the statement of the First Lord of the Admiralty to the protection of commerce, but for one slight reference to the protection of the commerce which is close to the enemy, can be most readily got at, for one line that is uttered in reference to that danger, we have columns on a danger which has never been the danger of this country since the days when navies have become organized. The danger which is displayed before us by authority is the danger of a country which has absolutely lost its command of the sea; the danger which is brought before us by the lecturer to-day is one which was most menacing when our command of the sea was most complete. Recollect that in the year 1810, when we had 664 cruizers, when we had 194 cruizers in the Channel where merchant ships were likely to gather close round our coasts, in that year we lost over 600 merchant ships, very nearly all off the coast of England. That was historically our greatest danger. It is the danger brought before us by the lecturer, but it is one to which we do not pay serious attention.

Captain FITZGERALD, R.N.: I wish to make a remark about the Declaration of Paris. I am not a lawyer, but we have had the opinion of a lawyer on the subject. For my own part I do not think it matters one button whether there is a Declaration of Paris or not. We know very well that declarations and treaties are only regarded as long as it is convenient to the people who sign them to do so. I do not think there is any necessity for having a Royal Commission. I cannot see what it is for, and I am quite sure you will never get it. I imagine that an Officer holding a commission in the Royal Naval Reserve would be as much authorized to fight as a Royal Navy man. I do not think there is the slightest danger of Captain Crutchley being hanged; if they hang him they might as well hang me, but there is not much difference whether we are hanged or blown up, as far as I can see. I imagine the lecturer somewhat underrated the patriotism of the ship master when he represented him as saying, "I cannot, however, be expected to ruin my prospects and throw up my berth for honour and glory, when the crisis has passed I shall be thrown on my beam ends. I pay my taxes, and let the men fight whose business it is to do so." I fancy they would all fight rather than give their ships up if they were authorized with a blue ensign and a commission to do so. Admiral Colomb in treating of the sailing tonnage question said that about half our commerce is now carried in sailing ships, 3½ to 4. Well, I never thought there was a question that the moment war was declared sailing tonnage would disappear off the ocean. You might have to

[1] I was influenced also in coming to these conclusions by the numbers 12,997 sailing vessels to 4,920 steamers.

make a provisional arrangement for their protection whilst going into neutral ports and discharging their cargoes, but as to sailing commerce being carried on in war, it is absurd and out of the question. I do not know how the steamers are to carry double their tonnage. They might perhaps try the new Admiralty plan and shift the Plimsoll's mark up a little bit, and load down to it. It has been successfully carried out in our men-of-war, and their paper tonnage increased thereby, and I dare say it could be done in merchant ships. With regard to the armaments for merchant cruizers I quite agree with the lecturer in saying that they should be kept abroad. They could always get armed in England, but there should be one armament abroad and one at home, so that they might pick up whichever was nearest to them. There seems to be a difference of opinion as to whether we shall be most in want of ships or men in case of war. I must say I agree with Admiral Colomb in thinking there would be no difficulty about the men. What we want is the ships. Stokers would really be our principal want, but there would be an enormous number of slow merchant steamers thrown out of employment. Stokers are not at all equally good, but no doubt we should be able to meet the requirements of the Navy, because after all we have not got so many ships, not half enough in fact; so I think the difficulty will be ships and not men. "Help the merchantmen to look after themselves and get and impart information." That is a most excellent remark: we should train the Royal Naval Reserve men not with the view of bringing them into the organized men-of-war; their place appears to me to be in their own ships. I quite agree in thinking that the Captains and Officers should not be turned out of their ships in war-time, ships which they know how to manage and are accustomed to. Moreover, their duty will be not to fight more than they can help, but to patrol the ocean, to act as the eyes of an Admiral as scouts and look-out vessels. We have not half enough cruizers, and these ships will do admirably as patrols. But as to fighting or the necessity for manœuvring power in a merchant steamer I have the misfortune to disagree with the lecturer on that point. I think speed is the main thing desirable.

Mr. E. H. Carbutt, M.P.: Perhaps as an outsider you would allow me to say I have been delighted to be invited here to-day and to listen to the excellent paper we have had. No doubt the question is becoming riper and riper every day before the country, are we going to protect ourselves? We are often told that we must go in for economy. I am in favour of economy, but depend upon it if the Government does not put the country in a proper position to protect our commerce they will suffer for it at some future day. I believe that if the case is properly put before the representatives of the country, they will vote the money and that we need not fear the question of £ *s. d.*, so long as we can show that the money is properly spent. It is therefore very interesting when we can get gentlemen of the mercantile marine to come here and lay their views before us. I agree with one of the former speakers that the Government has not done as much as is required in the way of preparation for protecting our commerce, that is to say, in the statement which the First Lord of the Admiralty put forward the other day, the main object did not seem to be protecting our commerce. I think, however, that Mr. Forwood, who has taken so much interest both in the mercantile marine and in the Navy, will be the last man in the world to let our commerce go without being properly protected. I think it is to his influence and that of one or two other gentlemen at the Admiralty that we are indebted for the Admiralty bringing out the schemes for these new fast scouts. Of course we all have to make a beginning, and these new scouts with very high speed and large coal endurance will be of very great service to the country. But what we are really wanting is guns. Wherever we go, whatever we read of, what we are doing abroad or in this country, the great deficiency is in guns. Even the First Lord of the Admiralty tells us we have several ships waiting for heavy guns, and Lord Brassey the other day in speaking of the defences at Bombay and South Africa said there again it was a case of wanting guns. I do hope the country will insist upon the Government spending money in letting us have proper guns so that we may not find, when war suddenly breaks out, that we are defenceless for want of guns.

Captain Curtis, R.N.: With reference to the comparison that has been made between steamers and sailing ships, you must remember that the steamer makes two

or more voyages to the sailing ship's one. As to manning these steamers, it has been said in this Institution that our sailing ships will be laid up in the event of war, and consequently their crews will naturally seek employment on board these steamers. With respect to the reserves, I know that some of the Royal Naval Artillery wish to go afloat in torpedo-boats, but from my knowledge of them many are not exactly the stuff that is required for such work. Captain S. Long, who is regarded as a high authority on the subject of Naval Reserves, says, practically speaking, our fishermen are not sufficiently considered in the scheme of Naval Reserve: in the event of war they will be prevented from following their daily calling, and would be left ready for service, and no doubt glad to take a part in the defence of their country. I should not like it to go forth from this Institution that the Royal Naval Reserve are thought so very little of. As it has been said they come in a very untidy state to the docks to drill, I think that might be the fault of the Commanding Officer. If he was strict and made a point of calling their attention they would turn out properly. The Coast Guard Commander at King's Lynn, the other day, said that at the Jubilee, 150 of the Naval Reserve men turned up in proper uniform, and he congratulated them and said he had not one complaint in six months. That is rather different to what has been said. Then these Naval Reserve men, these fishermen, know every inch of the coast—you could not have better pilots. With respect to coaling, I may tell you that when I was on the Pacific Coast I was employed in a very disreputable manner, namely, in smuggling on board a Government vessel; the people who suffered were many of them our own subjects—bondholders. The ship's pinnace and cutter were laden tolerably deep with dollars, crossed the bar of the River Altata at night, the Officers and crew were kept in the boats, under the main yard whip, until they were cleared, the ship rolling considerably. I am of opinion properly constructed boats, mere shells so as to fit into one another, in form somewhat after the Madras Masoola boats, bow and stern, would be suitable for coaling. Large vessels can nearly always form a lee sal-sea, and can tow a small vessel or boat so as to give her a sheer off. They not having experience sufficient afloat, they should have at least two actual weeks at sea in each year. A portion I suggest might be embraced in the mobilization scheme. It used to be said "it took one year to make a soldier, but three to make a sailor."

Captain W. H. HENDERSON, R.N.: I think the training of the blue-jackets of the Royal Naval Reserve is carried on in an obsolete and extravagant manner. There are nine old sailing frigates stationed for this object at the various ports, perfectly useless for any purposes of defence, yet costing a considerable sum annually to keep in repair and order. They bear a not insignificant complement whose services, except those of the instructing staff, are wasted. Why should not their places be taken by vessels capable of strengthening the local passive naval defence force of these ports? Corvettes, sloops, gun-vessels, gunboats, and even the smaller ironclads, when no longer fit for active service with the fleet, are useful and fit for local defence vessels. It would be a great saving if instead of being paid off into the 3rd or 4th Class Steam Reserve, when they cannot possibly be got ready for commissioning again except at a great expense of labour and time, and in many cases are allowed to rot until sold out of the Service. In each case they would serve as the nucleus of the local defence, could go outside for target practice, and the labour of their crews would at least be expended in keeping a local defence vessel in order, instead of one that is of no use whatever. I should take their masts out, but leave their guns, fittings, and other gear intact. The manner of employment of the R.N. Reserve men in war-time, the Admiralty will decide in working out a mobilization scheme—if they are to be largely used in supplementing the crews of men-of-war, then the greater the touch between them and the man-of-war's man during their training the better. Alluding to what has been mentioned by several of the speakers, there is no getting over the fact that the defence of the Empire rests on the shoulders of the Navy; it always has done so, and our insular and maritime position necessitates it. In the past we had to protect the country from invasion; in addition to this, and really the more vital function of the two, we have now to protect our lines of communication throughout the world. In the past this was not a necessity, it was of secondary import—now it is the primary

consideration; for if our supplies of food and war material are stopped, we must come to terms. Our possible opponents know this, and that it is our most vulnerable point. We must keep the command of the sea; if we lose it anywhere, that portion of the globe will be cut off to us. If the Navy is not strong enough to maintain its position, it will be withdrawn to protect the United Kingdom, and if we thus give up the command of the sea, and our trade is cut off, we shall be equally starved into submission without an invasion or the necessity of an investment even of our own shores—no military defence of the arsenals, commercial ports, or coaling stations can save us. Relatively, therefore, the Navy ought to be much stronger than at any previous time, for its duties are much more arduous. Is it so? Naval Officers say it is not.

Rear-Admiral Hon. E. R. FREMANTLE, C.B., C.M.G.: It is some presumption on my part to speak at all. I regret exceedingly not having been able to come here in time to hear the lecture, therefore my remarks will be very short. It was a lecture which I was particularly anxious to hear. It is one that I think is of the greatest importance, and when the Officers of the Naval Reserve come and tell us what is required to make the Naval Reserve a better Reserve for the Navy, I am sure we ought to be very much obliged to them for coming here. I should not have risen but that I strongly object to some things which have been said against the present system of Naval Reserve. It is not perfect, a good many things are not perfect. I am not by any means against a change in administration, or opposed to changes or improvements generally, but I must say I think in the present day what we want generally speaking is much more than is generally admitted—good administration, and not changes. The Naval Reserve is exactly a case in point. There is something to be said and a great deal to be said against some of the old hulks stowed away in a dock, but, on the other hand, a great many of them, stowed away in the dock though they may be, are models of cleanliness and models of men-of-war; and it is the fault of commanding Officers of a district, Captains, and of the inspecting Officers of these ships if they do not set a good example, and give the merchant seamen some idea of what a man-of-war should be. It has been said by some speakers that we could not expect Naval Reserve men to come and drill, that it is a great inconvenience to owners, and so on. I venture to say, although I am not a shipowner, that they must very often find it a great convenience to have the Naval Reserve to fall back upon. When I commanded a district ship some years ago I went to Shetland to inspect the Coast Guard, and there I inspected 200 Naval Reserve men on drill at the same time, and very well drilled they were; they had an excellent Coast Guard Officer, and everything was done as far as possible in man-of-war fashion. The Officer was a very able man. He prided himself very much on setting up the little compass and something to represent the wheel, and he stood in the right position, and I stood in the right position for Admiral or Captain, and everybody passed round and took off their hats in a very proper way. These are little details that should be carried out. I could mention many other circumstances of the same nature, and, therefore, I say what we want is that these things should be fairly and properly carried out, and with the best material at our disposal. If any change is required, by all means make it; but do not always and on every occasion blame the system, when it is the men who do not carry out that system. As regards the Naval Reserve Officers, and what has recently been done for them, in the last ship I was in not many months ago we had two Naval Reserve Officers, and extremely useful men. They came with the object of learning the work of a man-of-war, and I have no hesitation in saying that they learnt a good deal of it in a year, and I have no doubt we shall have learnt something from them too. That is a system I hope to see carried out still further. I am very much against a large reserve of Naval Officers. We hear it frequently said we have not enough Naval Officers in case of war. I really call it somewhat of a cuckoo cry. The first requisite in case of war is to have our ships thoroughly efficient, the ships that are ready and that can be ready at very short notice, and we shall not have them thoroughly efficient when they are manned by Officers who have had little or no experience in those ships; therefore, the first thing we must try to have is a limited number of naval Officers who shall be thoroughly efficient. Admiral Colomb told us about the proportion between sailing ships and steam ships

as being 3½ to 4. I think that is a little misleading. I do not know whether Admiral Colomb meant to assume it, but I am quite sure a great many of his hearers did assume that he meant to say the proportion of commerce carried was 3½ for a sailing ship to 4 for a steam ship. That is very far from the fact. I know there is a proportion in which we may talk of the number of voyages performed by a steam ship as compared with the number of voyages performed by a sailing ship, but I should imagine it would be something like 5 to 1. I think if you take the cargoes brought in the course of a year to England you would probably find about 5 brought in steam ships to 1 in a sailing ship.

Admiral COLOMB: Quite so.

Admiral FREMANTLE: If that is the case, only one-sixth of the carrying trade would be lost by sailing ships being laid up, and therefore we need not be quite so frightened about throwing all the sailing ships out of employment. With regard to the Declaration of Paris, I have never understood that it is worth argument. I agree with Captain Fitzgerald in thinking that International Law is one of those things which is extremely elastic. I saw at the India Office this morning a fine picture of the celebrated occasion on which Commodore Dance with his East Indiamen drove off a French squadron consisting of a line-of-battle ship and three frigates under Admiral Cluvis. Nobody ever supposed that they were acting improperly in defending their ships. They were not privateers, they had no letters of marque, they were merely East Indiamen, ordinary merchantmen armed, and which could and on that occasion did show fight, and to very good purpose. I cannot suppose for a moment that International Law, elastic as it may be, can be such as to condemn any merchant-ship which chooses to prevent itself being robbed, as was so well expressed by Admiral Colomb. I regret I am not able to enter more fully into this paper. I can only hope when one has read it that we shall find that the links between the merchant service and the Royal Navy will have been drawn tighter. An attempt has been made, at all events, to show how the links between the merchant service and the Royal Navy may be drawn more closely together, and anything that tends in that direction is worthy of the support of this Institution and of the consideration of Her Majesty's Government.

The CHAIRMAN (Lord Charles Beresford): I think, ladies and gentlemen, such a paper as this which has been presented to us to-day shows what immense good this Institution does. Here is a paper read by a gentleman who thoroughly understands the question he has taken up; he understands all the detail of the question, and he has got that gift which is, I think, not very common, that gift of a system in his head of organization to carry out what he proposes. Now, this question of the defence of the mercantile marine which is largely entered into in this paper is, in my opinion, one of the most important questions for this country, because the defence of the mercantile marine means actually our existence. It means our food supply, first of all; it means all our mercantile interests; and it means, besides, all the enormous amount of money that is paid in the rate of insurance. Now, it is the rate of insurance that ruins a country, because they cannot afford to either send out or to receive at home the vessels that bring the supply of food to this country. There are one or two points I might mention that have been noticed by some of the speakers. There is the question of armed cruizers. In the Board of Admiralty we thought it was most important to take up this question of the armed cruizer, and we threshed it out thoroughly; but the armed cruizer under no condition whatever is meant as a cruizer to fight unless attacked. It is meant to take such a position as this; it may be three positions. One is that directly war is declared, you send out one of these fast ships to a certain locality where someone of the enemy's vessels may be which is not at all equivalent to it, but which has got in what I may describe as a highway of the sea where trade is more or less focussed; and look what such a vessel as that of the enemy could do to your trade in the first three weeks after war was declared. That is one of the objects of the armed cruizer; she goes out and stops a very inferior vessel destroying perhaps in a dog-watch ten or twenty or whatever there is of English vessels in certain localities. Another use is that she should be used in these days when we are lamentably short of cruizers as what we call runners for the fleet, that she should be at a certain indicated place and communicate to the Admiral certain information which she

may find out. And another use is to enable her to go out and meet a cruizer which we might know of belonging to the enemy or one of our own ships which might be taken in arms, and there she is a very good match for her because she has the same scantling and speed; and we thought it was one of the most useful things we could do to take up these vessels to the limited amount of money and arm them. There is one point I must criticize in the paper relative to using a shorter vessel. I do not think a shorter vessel is so good, because you cannot get the speed out of the shorter vessel, and for the particular reasons which I have given we chose the long vessels. Another reason that we did not take up more than we did was this, that in these days of extraordinary quickness in building vessels we thought we had better take up vessels even that had not been built but had been designed, which may sound rather like an Irish bull. With certain companies we guaranteed under certain conditions the carrying of mails, and we promised that when their vessels were of such speed we would take them up and put them on the list. As to their armament, it would be very wrong for me to say where, but there are some places about the world to which the armament has gone out, so that the vessels in the different stations can at once go to certain places and put their armament on board. But more than that, the vessels we have taken up have the regular sponsons fitted, so that they are ready to put the guns in, in other words, they are far more useful than many of the vessels we took up some years ago which had no fittings at all. The Board of Admiralty have also taken up the question of coaling. I am sorry to say not nearly to the extent it ought to be, but I hope during the next evolutions they may be able to put the classes of ships into different positions, and that there will be certain days when the weather is bad in which those ships will undertake actually to carry out in detail what they would have to do in time of war. I entirely agree with the idea of having a system by which vessels should be able to change their route—the plan is most excellent—also of having a system thought out in time of peace of what you would do in time of war if your wires were cut. All that is excellent, if I may be bold enough to say so. And the lecturer's idea of how the merchant ships should communicate to the Admiral is most valuable, because it might save a whole fleet of merchantmen the panic that would occur if any one or from one to five ships homeward bound were destroyed. I venture to say that in the year 1885 that would have occurred, for there was then no system or shred of organization. The present organization, as has been so ably brought forward in this paper, is very bad. My own opinion would be, having read this paper over very carefully, that the great thing is publicity, inquiry, and discussion, and those of my brother Officers that did me the honour of reading what I said in the House the other day will know that I supported this Royal Commission so as to let the country know certain facts. You keep an Army and Navy, you have a great mercantile marine. You, as taxpayers, pay 31 millions—but what for? You pay it that you may be defended. Now comes the point—none of us, not even these gallant Admirals here, know actually what you want to enable your Empire to be defended. I say that ought to be brought out, that your experts ought to let people know. You ought to have a given amount of guns, ships, and men, and a regularly defined programme, such as is so well put in this paper, for the mercantile marine, so that directly you go to war, everybody knows what to do, and where to go. If I have an opportunity, and I shall make one, I shall try and get a Committee or bring it before the Admiralty that we should have a Committee of the men who understand the question, which is the mercantile marine, men like Captain Crutchley (and I have the honour of knowing a great number of men similar to himself), that should be presided over by a Naval Officer, and should thrash this thing out. It is all part and parcel of the defence of the country. And more than that, remember in time of war these ships must take care of themselves. Our fleets must fight the enemy's fleets, and our cruizers must look after their fleets and cruizers, but as to thinking that at the present moment the British Navy can defend your mercantile marine, it is utterly impossible, and nobody could prove that it is possible. As to the Admiralty not having worked at this question before, I hope on Monday to prove that it is impossible for the Board of Admiralty under its present constitution and system of administration to look at these sort of questions at all. I shall endeavour to prove that the present system is—and I cannot use words too strong,

I think the best way is to say—utterly rotten. You cannot work under your present system, and I shall do my level best on Monday to prove that what I say is true. I do not say one word against my late colleagues, or my late chief, because I think they have done extraordinarily well. And, remember, these great reforms that have been carried are financial reforms, dockyard reforms, manufacturing reforms, but they do not enable your fleet to fight a bit more than it does. Thanking you for listening to these words, I once more say that I consider this paper of the most excellent advantage to the country, and as far as I can I shall try and press it a great deal further than this Institution.

Captain CRUTCHLEY: There is only one point I should like to answer, that is as to the character of the British seaman. The British seaman I do not think is a bit worse than ever he was, in fact I think he is a great deal better. The only thing he wants now is to be treated like a reasonable being, and then you will get as much out of him as ever you did.

The CHAIRMAN: I thank Captain Crutchley once more for his most able paper. I am sure it will not only please his brother Officers in the mercantile marine and those seamen by whose labour and pluck we get all our luxuries and half our food, but it will also be read with great interest by our own Service, by my brother Officers in the Navy.

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OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

NOTE.

The continuation of the Article on "Regulations for Field Service in the German Army," published in No. 142, is omitted for want of space, but will be given in the next number.

THE ABYSSINIAN ARMY.

By Colonel G. A. Furse.

The circumstances under which the British troops in 1867–68 marched 380 miles from their base at Zula to Magdala without meeting any serious opposition are not to be taken as a criterion of the power of the Abyssinian Army in repelling an invasion of their country. The official narrative of that expedition has left it on record that at that period "the Emperor Theodore was no longer an Emperor except in name. The only spots where he possessed authority were his own camp, which was *en route* from Debra Tabor to Magdala, and Magdala itself, which was held on his behoof by certain chiefs, still attached to his fortunes . . . ." The number of fighting men with him in his camp was variously stated at from 3,000 to 8,000.

At that period Prince Kassai had broken into open rebellion, and had gained possession of Tigré, and King Menelek of Shoa had advanced with the intention of capturing the fortress of Magdala, though, when within sight of that stronghold, he had withdrawn his army without making any attempt to carry it. Wagshum Gobaze, the ruler of Lasta, another powerful prince, was also a hearty enemy of Theodore.

In those days Wagshum Gobaze was credited with being able to take the field at the head of 30,000 men, and King Menelek mustered at one time 30,000 cavalry and 20,000 infantry under his standard.

The ideal of perfection for an Abyssinian is a state of war. In war he finds an outlet for his ferocious instincts, and a legitimate means for becoming wealthy and powerful. As the position of Ras or General may be conferred on anyone who has distinguished himself in war, however low his origin may

have been, every Abyssinian might well be said to carry his marshal's baton in his knapsack—were he burdened with such an article.

It is a striking illustration of the warlike instincts of the Abyssinian people that the Negus and other chiefs, in their letters and interviews with foreign emissaries, generally make allusion to the well-being of their Army or of their soldiers. Whether this is an indirect way of alluding to their power or simply a *façon de parler* it is not quite clear; however, as the flower of the Abyssinian population are soldiers, this substitution of the Army for the people is to a certain extent logical.

A constant state of war in Abyssinia is the natural consequence of a want of a proper system of revenue, the armed bands being simply supported by depredations and confiscations effected on their weaker neighbours beyond the border. Their cruel system of warfare, and the inhuman fate which befalls their captives, though entirely at variance with the Christianity they profess and the civilization of the present age, are based on the examples of the warlike deeds and other customs recorded in the Old Testament. Rohlfs narrates how, when expressing to Balata Gebro, a well-known Abyssinian adventurer, his horror for the inhuman mutilation of their captives, that chief referred him to Chapter xviii, verse 25, of the Book of Samuel.

The administrative system in Abyssinia is in the hands of the Scium, and, as Bianchi puts it, the Negus can only be a proper ruler as long as he can be the Scium of Sciums. The Scium, like a well-known character in Sir Arthur Sullivan's popular operetta, the Mikado, himself personifies every functionary; he is the Mayor, the Prefect, he collects the revenues, administers the finances, and is treasurer, military chief, recruiting officer, &c. Of Sciums there are various kinds—those of towns at times, called *dègiasmace* or *memer*, and smaller ones, heads of villages only. Both great and small, they are the most wealthy persons of each town or village. Though held of little account at the residence of the King or of a Ras, everything depends from them in their respective towns or villages.

When the King decrees a levy *en masse* he issues his orders to the subordinate Kings, these to the Ras, the Ras to the dègiasmace, to the memers, and to the Sciums, who call up all the men, young or old, capable of bearing arms, by virtue of a feudal system by which the followers of each chieftain, his sons, dependants, and slaves are bound to follow their masters in time of war. The Scium leads his contingent to the place appointed by the Ras, and the Ras conducts the various bodies to the place indicated by the King. No complicated returns or states are required, the word of the Scium that all are present is accepted as sufficient.

Youths from ten to twelve years of age begin their military career as arm-bearers, until at the age of eighteen, having provided themselves with a shield, a sword, and a gun, and found as a substitute some ambitious youngster, they go to swell the ranks of the warriors as recruits.

It is recorded how, in the interview between Prince Kassai and Sir R. Napier on the banks of the Dyab, the Prince and his followers were delighted and impressed by the Armstrong guns, and how the former dismounted and closely inspected the pieces, handled the shells, and looked through the rifled barrels.

The following remarks made at that time[1] with respect to the appearance, armament, and power of manœuvring may account for the unchecked series of victories reported by this Prince after the British expedition had accomplished the overthrow of the Emperor Theodore:—

"The rivulet was crossed, and in a moment they (Sir Robert Napier and the Officers of his Staff) found themselves in the middle of the army of Tigré.

[1] See "Record of Expedition to Abyssinia," Vol. I.

All were astonished at their appearance and armament. They clustered round the few Englishmen in dense but orderly masses. Their heads were bare, except for their plaited hair; their costumes were picturesque, long white togas embroidered with scarlet; they were nearly all possessed of fire-arms of every description—from the matchlock to the double-barrelled rifle, but by far the greater number had double-barrelled guns of English or Belgian manufacture. Many had pistols, and all had the long national curved swords worn on the right side, a cut from which it is said to be impossible to guard. The few—but there were very few—not armed with firearms had sword, spear, and shield. Of the 4,000 now present, about 400 were cavalry, mounted on mules or ragged wiry ponies. The horsemen were armed similarly to the foot soldiers. These men were truly an enemy not to be despised. Hardy mountaineers, quick in scaling the most difficult paths of their rugged country, they would give an infinity of trouble to an European force . . . . Their discipline was good, and in their short visit they showed a power of manœuvring which would not have disgraced the forces of a civilized nation."

The impossibility to guard one of their sword cuts appears to be somewhat exaggerated, for the Abyssinian swordsmanship is limited to cutting, neither does he attempt to point or parry, and his cuts are as easily parried as those of the once boasted swordsmen of the East. The sword is worn on the right side so as not to interfere with the use of the shield; also, as the Abyssinians mount on the off-side, carried thus it facilitates their getting on to their horses. They do not understand the use of the bayonet.

The victories gained over their Egyptian foes have been instrumental in providing the Abyssinians with a certain amount of firearms of modern model. Bianchi puts down the arms taken from the Egyptians at 20,000 Remington rifles and 30 pieces of ordnance. From all accounts, however, it appears that only 2,500 Remingtons were captured at Gudda-Guddi, and 13,000 at Gura. Other firearms, besides the 855 presented by Lord Napier to Prince Kassai, have been purchased from different merchants. The great desire to possess firearms—such a striking feature of the Kaffirs in South Africa—is showed by the Abyssinian warriors, and the present dispute between the Negus and the Italians has perhaps, more than anything else, been brought about by the heavy duty imposed by the latter on the import of arms and ammunition. To the other firearms captured from their enemies by the Abyssinians must be added over 500 Wetterli rifles taken from the Italians at Dogali.

With respect to the quality of the arms, it should be borne in mind that in a guerilla warfare men armed anyhow are capable of doing much harm. The Abyssinians are reputed very fair shots, and are careful of their ammunition, of which they possess but a scanty store.

The latter constitutes one of their main difficulties, for the ammunition of the present arms of precision is next to impossible to be manufactured without suitable machinery and skilled artificers, and it is not probable that the few European workmen in the country can render any assistance in this direction.

The variety in the pattern of firearms must add considerably to this difficulty. With a rigorous blockade of the coast it will not be easy to obtain a supply of ammunition from traders, who themselves may not be in a position to supply the special description of ammunition most needed. The principal store undoubtedly consists of Remington ammunition captured from the Egyptians.

In all armies which are not governed by a regular organization, one of the greatest difficulties lies in forming an approximate estimate of the number of the men under arms not very far from the actual fact. As there is no

census in Abyssinia it is difficult to even estimate the number of inhabitants in each division of the country. Cecchi, the well-known traveller who has given proofs of possessing great power of observation, in his notice on Northern Abyssinia assigns 2,500,000 inhabitants to Tigré, Amhara, and Gojam, 2,000,000 to Shoa, 100,000 to the provinces of Bogos, Mensa, and Beni Amer, and 3,000,000 to the Galla territories of Southern Ethiopia, forming in all a population of 7,600,000 inhabitants.

In such a nation, governed by a feudal system, where habit has imparted to the manhood of the country martial instincts, and the career of arms is one of the two only which are recognized as worthy of respect, such a population would naturally yield a numerous body of combatants. Captain Cecchi estimates that, for a defensive war, Abyssinia could mobilize 145,000 men able to throw a spear. Of this total he considers that Amhara could contribute 35,000 warriors, Tigré 20,000, Gojam 20,000, and Shoa 70,000.

In an offensive war, far from the most populous centres of Abyssinia, this number he considers would undergo a considerable diminution. In this case probably not more than 82,000 men would be forthcoming; 25,000 from Amhara, 15,000 from Tigré, 12,000 from Gojam, and 30,000 from Shoa.

It is impossible to deduce any accurate data as to numbers from former wars, as the number of souls in an Abyssinian camp increases gradually as an army advances, until it attains very large proportions; of these, however, a very small minority only takes part in the actual hostilities.

The Negus's army shows a gradual increase. At the battle near Adoa (1871), when King John defeated Gobaze, he could only lead 12,000 men against the 60,000 of his opponent. In 1875, at Gudda-Guddi, his army was said to muster 50,000 men, and in the following year, at Gura, he attacked Ratib Pasha at the head of 200,000 men. In all these cases the numbers are only to be taken as approximate, as the Negus never knows precisely the number of combatants he leads to the field, no roll of any sort being kept.

A regular system of victualling is unknown in the Abyssinian Army; this is generally fed from the resources of the country by means of requisitions, or more accurately speaking appropriations, and by supplies brought by the many slaves and women which accompany the army. Herds of driven cattle often follow the columns. The Abyssinian warrior is so frugal that a large number of Abyssinians could live for a year on the same amount of supplies as would last only two or three months for the same number of Europeans. Face to face with an European army strongly entrenched, which their want of suitable artillery would prevent them from attacking with any chance of success, this want of any organized system of supplies brought up from the rear would seriously militate against a large number of warriors keeping together.

In their encampments the principal Chiefs alone have tents, but the rank and file know how to improvise them readily. Ordinarily, two or three comrades set up a few sticks over which they spread their sciammas, and thus get the shelter they require. If compelled, however, to remain on the same ground for some time, they manage to run up huts made of branches of trees covered with straw or grass. The Chief, whoever he may be, always encamps in the centre, and a red tent in the camp is a sign that the Negus is present with the troops. When the Negus, Ras, or other Chief strikes his tent it is a signal for the troops to get into motion.

Rohlfs thus describes the rapidity with which this is carried out: "When we consider that about 40,000 souls (of which there could not have been less present at Samara) started in six hours with a certain order, we must admit that an established rule is observed. No words of command were heard, it was as if an invisible spirit directed everything, without any appearance of confusion. It should be known that there exists in Abyssinia from a thousand

years a fixed order of encamping and marching; every Officer, every employé, knows when and where he is to march with his body and encamp."

There is nothing recorded by competent eye witnesses as to the tactical system pursued by the Abyssinians. The Egyptian operations of 1875–76 resulted in such complete disaster that it was no doubt considered by the principal surviving actors desirable to throw a veil of oblivion over them, thus a record of actual experience was lost to us. Captain Cecchi has summed up in a few pages about the best description of the marching and tactical system of the Abyssinian Army. His description aims to be no more than a sketch, but in an army where the art of war still retains its very primitive forms, it does not require chapters and volumes to give an insight into the tactical system generally followed.

From this sketch we gather that the Abyssinian marching formation, independent of the numerical strength of the force, comprises an advanced guard, a main body (divided into right and left wing), the convoy, and a reserve. The advanced guard led by a *degiasmace* (*alias*, dejasmak or dejaj) or by a Fitaurari, from 1,000 to 1,500 strong, precedes the main body by one or two days. This section has to pitch the tents for the Commander-in-Chief, prepare the encampment, and collect, or even appropriate, the necessary supplies.

At the head of the main body, mounted on mules, are a group of drummers and trumpeters, all clad in red cloth, followed by a multitude of singers, dancers, acrobats, and jesters. Then follows the first corps of musketeers, usually armed with breech-loaders. The bulk of the cavalry marches immediately in rear of this body, and then comes the remainder of the infantry, marching in a mass with no regular formation or discipline.

Between the main body and the rear-guard comes the *guaz*, a species of transport train. This consists of many thousand slaves of both sexes leading a very large number of mules laden with war materials, baggage, and food, the latter comprising flour of wheat, *tief* or barley, intended for the alimentation of the Negus and of his high officials. The Abyssinian soldiers provide themselves with what they may require for the first three or four days, beyond which they are expected to supply themselves by plunder and raids made in the country they pass through.

This horde of slaves, as well as prisoners captured in battle and a multitude of indigents which augments steadily during the advance, if the operations are successful, are employed to carry the plunder of the conquerors.

When the leaders foresee or even suspect the vicinity of the enemy, for the Abyssinians are very adept in the art of scouting and reconnoitring, they push forward the advanced guard and take steps to close up the rear-guard, which has to look after the protection of the *guaz*. After this they select or endeavour to occupy the most promising position for fighting.

The Abyssinians know of no established order of battle, but their dearth of ammunition makes them very cautious in firing so as not to waste a shot, consequently they seldom indulge in musketry fire at long ranges. They attack suddenly and with great impetus. At Gudda-Guddi they were well concealed in the forests, at Gura they were formed in the open, assumed the offensive, and crushed the Egyptians simply by their enormous numerical superiority. At the moment of attack the infantry divide themselves into several columns, and with uplifted spears throw themselves on the enemy at a rapid pace. After the first shock, and the first discharge, if the enemy is armed with firearms, the combat becomes very close, a fierce hand to hand fight accompanied by wild and unearthly shouts.

The Abyssinians on foot or on horseback, stationary or in movement, are very expert in throwing a spear, which they direct with force and precision. They are practised in this from their earliest youth.

The cavalry posted on the wings has first to support the action of the infantry. However, it soon engages on its own account, urged forward by the desire, in case of success, not to be behindhand in plundering, or to be in a position to retire as rapidly as possible in case of defeat. Quick in attack as in defence, groups of 50 or 60 horsemen detach themselves at a time from various points, and fall on the enemy coming within their reach; without drawing bridle, they throw their spears where the enemy is thickest, and wheeling their steeds sharply round, retire in the same manner. Protecting their back with their shields, they bend down on their stirrups to pick up any spears they may find on the ground.

Thus shortly after the fight has commenced the *mêlée* becomes general, very dense, deadly, and fierce.

The pursuit of the fleeing enemy is carried out with rigour and persistence, and this only ceases when the victors have become masters of a portion of the *guaz*, which the defeated enemy has been compelled to abandon.

Bianchi states that there is no fixed distinction between cavalry and infantry, for in Abyssinia every warrior is a horseman as long as he has and can keep a horse. All the infantry can ride and may be turned into bodies of cavalry, if horses are available and circumstances require it. All are equally exercised, but the cavalry have to dismount and act as infantry according to the nature of the ground and the orders that are issued.

THE ITALIAN EXPEDITIONARY FORCE.

By Colonel G. A. Furse.

The unexpected attack and the defeat of the small Italian column at Dogali, in the month of January last year, and the ill-advised measures which followed that event, produced such a want of confidence in the Italian Ministry of the day that it was compelled to resign. General Ricotti, who was saddled by the verdict of the country with the responsibility for these events, was succeeded in the Ministry of War by General Bertolé-Viale.

The Italian Premier, in his speech at the banquet given in his honour, at Turin, and the King in his address, when opening the Chambers a few weeks later, explained that the policy of Italy in Africa would be, first to avenge the attack on the Italian troops at Dogali, and after that, to enter into such commercial relations with Abyssinia as would turn to the benefit of both countries.

Amongst the first measures of the new Minister of War were a demand for a credit of 20,000,000 of Italian lire for extraordinary expenses in connection with the military operations in Africa, and the formation of a special corps of 5,000 volunteers, with the object of freeing the regular army from a continuous service on the Red Sea stations.

This corps was to be composed thus :—

Officers	238
Staff, personnel, and analogous services, men	85
Two regiments of infantry (rifles), each of three battalions with four companies	3,420
One squadron of cavalry (mounted rifles)	150
One brigade of four companies of artillery	572
One company of engineers	185
One company of medical corps	100
One company of supplies	150
One company of transport	100
	5,000

The first infantry regiment, and the squadron of cavalry for this special corps, were raised in Rome, and the second infantry regiment was raised at Maddaloni.

The command of the troops in Africa was conferred on Lieutenant-General Asinari di San Marzano. This Officer, born in Piedmont in 1830, commenced his military career in the cavalry, then, having in 1866 joined the Staff, became chief of the Staff of General Bixio's division. He enjoys the confidence of the Officers who have served under him, and in recognition of his services with the Italian expeditionary force has been quite lately decorated with the Grand Cross of the Order of San Maurizio e Lazzaro. Colonel Vigano is the chief of his Staff, with Major Arimondi as his under chief.

A remarkable instance of the progress made by the Italians in military matters is the completeness of all the arrangements connected with the present expedition. The conditions imposed on the press correspondents have, however, been so rigorously kept that very little detail information can be gathered from the public press as to the doings, numbers, &c., of the Italians about Massowah.

The troops sent there up to the present moment are divided into four brigades under the orders of Generals Genè, Cagni, Baldissera, and Lanza. The composition of the force is shown in the annexed table; the totals calculated on the establishments of the special corps alluded to above would appear to amount to about 18,000 men, inclusive of the Bashi-Bazouks, but exclusive of the Officers. This accords with Veterinary-Surgeon Beech's estimate, who sets the total of the Italian forces around Massowah at 18,000 men, of whom 8,000 are non-combatants.

Distribution of the Forces.

1st Brigade, General Genè.

1st Regiment of Rifles (1st, 2nd, and 3rd Battalions).
2nd „ „ „
A Mountain Battery.

2nd Brigade, General Cagni.

1st Regiment (2nd, 9th, and 10th Battalions of Africa).
2nd „ (11th, 12th, and 13th „).
1st Mountain Battery of Africa.

3rd Brigade, General Baldissera.

Regiment of Bersaglieri (1st, 2nd, and 3rd Battalions of Africa).
Alpini (1 Battalion).
2nd Mountain Battery of Africa.

4th Brigade, General Lanza.

3rd Regiment (3rd, 6th, and 7th Battalions of Africa).
4th Regiment (4th, 5th, and 8th Battalions of Africa).
One company of the 17th of Artillery.

At the Disposal of the General Commanding.

Cavalry.

One squadron of Cavalry of Africa.
One squadron of mounted Rifles.

Artillery Mountain Brigade.

3rd company Corpo Speciale.
4th „ „
One company of the 13th of Artillery.
„ 15th „

Engineer Brigade.

1st company Engineers of Africa (1st regiment).
2nd „ „ (2nd „).
3rd „ „ (3rd „).

Transport.

A brigade of the train.
An irregular transport corps.

Medical.

1st sanitary company of the Corpo Speciale.
One sanitary section of Africa.

Supply Corps.

1st supply company of Africa.
A platoon of ditto.

The formation of a squadron of mounted Infantry was decreed in General Orders of the 24th of November, 1887.

On the 20th January the four brigades occupied the following positions :— General Genè, 1st Brigade, was at the entrenched camp at Takback South on the Agbalo ; General Cagni, 2nd Brigade, was at Takback North ; General Baldissera, 3rd Brigade, in rear of the Apes plateau ; General Lanza, 4th Brigade, at Arkiko.

Besides many redoubts and field works constructed by the troops, Fort Abdel-Kader has been placed in a proper state of defence, and new forts have been built, such as Fort Victor Emanuel, Fort Umbert the first on the Canfour hills, Fort Queen Margherita to the south west of Monkullo, near Tata. The Italians have also three new armoured portable forts to be erected near Dogali.

Great efforts have been made to collect transport animals, mules and camels, for the conveyance of water, supplies, and war material. A large number of these animals have been purchased from the natives, who have offered them for sale. Mules have been despatched from Italy ; 300 camels have been received from Aden, and the Kantibai of the Hababs has supplied 1,000 camels.

A General Order (No. 75) issued on the 7th of December last, lays down how the impedimenta are to be distributed amongst the pack animals allotted to each body of troops. It may be instructive to give this order here *in extenso*—

"The distribution amongst the pack animals assigned to each company, battalion, and regimental staff, of the articles indicated in the General Order (No. 31), of the 20th November, will be as follows :—

" 1st. Transport for each company, 10 mules. Mules Nos. 1, 2, 3, and 4, two kegs of water each.

" Ditto 5 and 6. Officers' effects (viz., baggage, field blankets, tents, canteens, and reserve provisions), stationery, and sack of reserve shoes.

" Ditto 7 and 8. Provisions and company cooking utensils (except camp kettles).

" Ditto 9. Camp kettles or ammunition boxes, as may be ordered from time to time. The pack saddles consequently must be so prepared as to be able to carry either description of load.

" Ditto 10. Spare, or to carry the pioneers' tools.

" 2nd. Transport for the staff of a battalion, 10 mules.

" Mules Nos. 1 and 3. Officers' effects (viz., baggage, field blankets, tents, canteens, and reserve provisions), stationery, and water keg.

" Ditto 3 and 4. Medical effects (viz., panniers, field medical companion, and stretchers).

" Ditto 5, 6, 7, and 8. Reserve water kegs.

" Eventually depositing the kegs, these may be employed to convey ammunition.

" N.B. The battalion will demand, at once, 8 kegs.

" Ditto, 9 and 10 spare.

" 3rd. Transport for the Staff of a Regiment, 6 mules.

" The loads will be distributed in the manner the Commander of the Regiment may deem best.

" N.B. The forage and grain for the mules of each company, battalion, and regimental Staff will be distributed amongst all the mules as it may be found

most practicable, keeping in view the condition of the mules and the weight of their respective loads."

The railway in course of construction, from the base to Sahati, will greatly facilitate the transport of the water, supplies, and war material. This railway, it is understood, will be completed by the end of this month, and has been laid down on an average at the rate of 252 metres a day.

The same day in which the above General Order was issued, another, No. 76, laid down the equiment to be carried by the soldier.

"The equipment for the soldier on the march will be as follows :—

"Cape, folded with pole and pegs in the tent cloth, carried on the back, or *en banderole*, as each Brigadier may be pleased to order. The mess-tin will be so fastened to the load as to ride behind the shoulders.

"In the bread-sack six packets of cartridges (for rifle regiments three packets of cartridges), reserve provisions, and bread for the day.

"The water-bottles always, when possible, will be filled with water."

The following General Order (No. 4) issued by General Lanza, commanding the outposts on the 30th November, 1887, deserves to be noticed :—

"In addition to the dispositions contained in General Order No. 1 with respect to the outpost service, I deem it desirable to arrange as follows :—

"The outpost service will be conducted in accordance with the prescriptions contained in the regulations for field service, with the following special instructions :—

"1st. No one will enter or proceed beyond the line of detached posts unless furnished with a pass issued from headquarters or from the superior direction of the outposts.

"2nd. Natives will be permitted to go and cut wood or graze their animals beyond the line of detached posts as long as one of the ı, warranted by the Naib, is furnished with a pass for the total number of individuals who accompany him.

"3rd. The natives referred to above will not be allowed to proceed in front of the line of detached posts beyond the limits of the radius of observation assigned to these.

"4th. Free transit through the line of detached posts will be permitted to all such as can furnish, as a countersign, a quill closed with sealing-wax at both ends, containing on a piece of paper a progressive number.

"5th. Any individuals who should attempt to elude the vigilance of the outposts, or who may present themselves without a pass, will be arrested and conducted to the reserves of the outposts. The commanders of the forts of Arkiko, Monkullo, and Otumlu will inquire into the personality of the arrested, and, if necessary, will hand them over to the Royal Carbineers, telegraphing at once to headquarters. The commander of the reserve Ghaufur will have the prisoners accompanied to the forts near Arkiko and Monkullo.

"The Grand Guard of Emberemi will under this head correspond direct with the commander of the Otumlu fort.

"6th. Prisoners coming from the exterior will be invariably blindfolded.

"7th. At Emberemi there is a buluc furnished by the 1st Halai with orders to exercise from that locality a close supervision over the territory, giving information to the commander of Fort Otumlu whenever it may become necessary. A continuous service of intercommunication will be carried out between Emberemi and Otumlu by three patrols by day and the same number by night (composed of Bashi-Bazouks), by means of which the commanders of the 15th and 16th Grand Guards will be kept informed. The patrols will ordinarily proceed by the track which goes from Otumlu by the Grand Guard of Emberemi. The commander of the Otumlu fort will order these patrols to report themselves both in going and returning to the Commandant of the latter.

"8th. The regulations contained in General Order No. 49 of the Commander-in-Chief will be borne in mind with reference to signals by night, noting that the Grand Guards must provide themselves with rockets.

"By day the signals will be made in compliance with the instructions contained in No. 355 of the regulations for field service."

Three star-rockets are the signal for alarm, when all the troops must turn out at once, and take up the positions assigned to them, remaining there until dismissed by other rockets.

A captive balloon equipment has been supplied to the Italian forces under the direction of Captain Pecori and Lieutenant De Gennaro, of the Engineers. Electric lights have been mounted on Fort Abdel Kader, and at Dogali.

The Italian Commander-in-Chief has endeavoured to captivate some of the Chiefs of the neighbouring country. Debeb appears to be the most prominent Chief who has thrown in his lot with the Italians. The tribes of Akrue, Hevo, and Digsa have joined him, and he expects four more from the Halai to do likewise. His numbers are said to be increasing daily by the continual accession to his ranks of discontented Abyssinians. He is apparently the Abyssinian Deboob who was sent to Suakim by Suleiman Pasha, as recorded in "The Insurrection of the False Prophet," Part II. He is not to be trusted.

It has been arranged, so as to recognize the friendly tribes, that each man will wear a blue veil, either round the head or transversely over the shoulder.

On the 23rd of November last the medical officers were detailed for duty with the various Staffs, battalions, batteries, and departmental services in addition to the field hospitals. The S.S. "San Gottardo," has been turned into a floating hospital with beds for sixty patients. The medical, in fact, as well as the Commissariat and other departments, have proved themselves thoroughly efficient. Great forethought has been exercised in the preparations, and portable huts, water-tanks, and land torpedoes for defensive purposes have been provided.

The General exercised his troops by giving them a false alarm by which it was ascertained that everyone perfectly understood the position he had to occupy in case of actual attack. From all reports the spirit of the troops appears excellent.

Under date of the 6th December, 1887, a direct postal service was arranged between Massowah and Italy. Every Friday, commencing from the 9th December, at 10 A.M., a postal steamer is due to leave for Naples, a corresponding one leaving Naples every Thursday afternoon, and reaching Massowah in the first days of the week. Every Wednesday a postal steamer leaves Assab, proceeding thence to Aden, and thus affording a second postal line.

General Order No. 72 of the 6th December, 1887, gives the necessary details as to the distribution of the letters after the arrival of the postal packets, as well as to the latest hours for posting registered letters and ordinary correspondence.

Whilst the Italian people show a certain amount of discontent because no actual hostilities have yet been reported, General San Marzano, as a prudent commander, has been unremitting in his attention to organize his forces and make his position secure from attack. The inaction of the Abyssinians has given him—what is not often found—plenty of time to effect all this, and by all accounts he has turned the time so gained to advantage.

Every appliance that modern science has given to war—railway, electric light, torpedoes, balloons, &c.—have been supplied to the Italian expeditionary corps; and people acquainted with the country manners and ideas of the Abyssinians are on the spot to give the benefits of their knowledge to the Italian Commander-in-Chief.

THE RUSSIAN ARTILLERY IN 1888.[1]

By Captain C. À COURT, Rifle Brigade.

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[1] For further information see the "Armed Strength of Russia," 1886; the *Revue Militaire de l'Étranger*, 1880–1887; *Die Organisation der Russische Artillerie*, Schultz; *Revue d'Artillerie*, 1878–1887; Russian Artillery Journal; Ministerial Orders and Regulations; Hazenkampf's Administrative Course at the Staff Academy; *Deutsche Heeres Zeitung*, 1884; *Archiv für die Artillerie und Ingenieur-Offiziere*, 1884–1887; Pamphlets and Essays, by Generals Engelhardt and Fersmann, and Colonel Chklarevitch; Colonel Löbel's *Jahresberichte über die Veränderungen und Fortschritte im Militär-Wesen*, 1875–1887; *Zeitschrift für die Schweizerische Artillerie*, 1880; *Die Land und Seemacht Russlands*, v. Schneher, 1887; *Militär-Wochenblatt*, 1880–1887; *Rivista Militare Italiana.*

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No arm of the Russian service has undergone more serious reforms within the last few years than the artillery: none has done better credit to the reformers. If we look back some fifteen years or more, and trace the various improvements which have been effected in this arm, whether in organization, in numbers, or in material, we must in justice allow that the subject has been handled in a wise and enlightened manner, and that no effort has been spared to render very real the support of Russian guns to Russian infantry. Thus in 1870, when only half the present number of infantry Divisions existed, there were only three batteries to each Division; by 1872 these were increased to four, and the 5th and 6th batteries ordered to be ready within three years; in 1875 the horse artillery was reorganized and distributed among the cavalry Divisions: in 1876 the mitrailleuse batteries were abolished and replaced by light batteries, while that most important service, the fortress artillery, was given renewed vitality by a sensible scheme of reorganization: from 1877 to 1879 the new material for field guns, together with a new and excellent

equipment, were tried, adopted, and issued to batteries with a most commendable promptitude. In the latter year mountain batteries received a separate existence : lastly, in 1885 sortie and depôt batteries were formed, and the field parks placed on a level with the requirements of modern war.

The Russian artillery, like the rest of the Army, has been for many years in a transition state, but this period is now over for the one as for the other : the great work of reorganization, carried on for so many years with exemplary zeal and activity, is now accomplished, and although it must be always true that a good military system is never at rest, but always seeks for improvement under whatever name, still the bases of the work are so far established that no great radical change is very probable, at all events in organization, for some time to come.

I. Command.

At the head of the artillery arm in Russia there is a "Grand Master" with the grade of General of Artillery, who is also *ex-officio* chief of the General artillery direction at the War Ministry as well as President of the artillery commission. His authority is supreme over all personnel and matériel, while the ultimate decision on all questions of armament and instruction rest with him as well : his powers of discipline over those officials and agents forming part of the direction itself are equivalent to those of the commander of a Military District. The office of the Grand Master is thus the great centralizing machine for all the services of the artillery, but the vast distances which deny to Russia the uniformity of an ideal organization make it necessary to subdivide this command just in the same way as that of other arms and services is subdivided. In addition therefore to the general direction and the services directly controlled by it, the various artillery corps were formerly regulated to pass under the chiefs of Military Districts in respect to all questions of general service, recruiting, discipline, and mobilization, and to a certain extent are still subordinate to these regional offices. The Grand Master retains the chief share of what may be called the patronage of the arm, that is to say, he selects Officers for the command of corps, and nominates candidates for high commands and employment, while his permission is required for the transfer of soldiers or officials from the territory of one Military District to another. On the other hand, transfer of Officers from one artillery brigade to another, or from field to fortress or depôt artillery, requires the sanction of the Emperor. The Grand Master inspects, either personally or by deputy, all troops and establishments under his command, but there is not always the same method and usefulness in these inspections as is the case in Germany : the principle of inspection is indeed admitted in all its force, but between theory and practice there is a great gulf fixed, and inspections of all kinds are too often carried out with such regard for appearances as to detract greatly from their value. The post of Grand Master is usually given to a member of the Imperial family, and in this case an Assistant Grand Master is appointed : the staff of the Grand Master consists of two Generals and four Aides-de-camp, his assistant has one Aide-de-camp.

All motive power emanates from this general direction at headquarters, and the personal character of the Assistant Grand Master makes for much in the future of the arm : the orders issued are addressed to the subordinates on the next lower rung of the hierarchic ladder, namely, the chief of Military Districts, whose offices form a kind of regional ministry with a composition analogous to that of the central administration, although on a smaller scale. The chief of the District forwards these orders and instructions, in so far as they concern the field artillery, to the chiefs of Army Corps, and as regards the fortress artillery, to the commanders of fortresses. Certain services, factories, arsenals, and establishments are placed directly under the

orders either of the Ministry or of the District staff. The general direction of the artillery at the War Ministry has seven sections, a cabinet, a service of military law, and a record office, while in addition certain services are directly governed by it. The seven sections deal with personnel, arsenals, fortresses, armament, powder mills, accounts, and reports respectively. The services directly governed or controlled by the general direction include the artillery committee, the inspections of fortress artillery and technical establishments, powder mills and factories, together with the Artillery School and Academy, and the office of the Artillery Journal.

In each Military District there is a Lieutenant-General in command of the artillery, whose authority formerly extended not only over the depôts and establishments of the artillery of the District, with the exception of a few which referred to the general direction, but also over the fortress troops and the corps of field artillery forming part of the Army Corps localized in his district. He was further charged with the instruction of Officers and men, their inspection and supply with the necessary material. A conflict of powers frequently arose as a natural consequence between these Officers and others at the head of the artillery of the Army Corps, who found their domain invaded at every point by an Officer not directly responsible, with all his power, for the efficiency of the arm in the field.

In 1882, however, the Emperor, "anxious to realize in a more precise manner the object aimed at by the creation of Army Corps in 1874," decided :—

(1.) That the corps of field artillery forming part of the Army Corps should be taken from the authority of the commandant of the artillery of the District and placed under the chief of the Army Corps, through the artillery commandant of the Corps.

(2.) That the artillery commandants of the Districts should be deprived of all their rights and duties in matters of military instruction and technical training of troops forming part of the Army Corps, but that they should retain their authority over the polygons and their administration. Since this change the chiefs of the artillery of each Army Corps have been responsible to their Corps commander alone, and the useless and often harmful intermediary at the District office exists no longer. Very great advantages have been derived from this step, which harmonized with the needs of the service, and promised a far better and more suitable control, since it replaced the old system by another which laid down that the leaders of the arm should be the same in peace and war, a principle of command far too often and too lightly neglected.

Simultaneously with this reform the horse artillery batteries were taken from the command of the cavalry Divisions and also placed under the artillery commandant of the Corps, since it had been found that cavalry Generals, not feeling qualified to interfere with technical details, cared little about the service of their batteries, and busied themselves mainly with their regiments : and that horse batteries often deteriorated in consequence of this neglect, and of their comparative isolation from the rest of the service.

Artillery is now as directly under the artillery commandant of the Corps as the infantry and cavalry are under their own Divisional chiefs. The artillery commandant is responsible that all batteries are up to their full peace strength, that the effectives are equalized in brigades, that vacancies are at once filled up, and no men detached from their proper duties unnecessarily ; he inspects the monthly returns, and inquires into any case where it appears that the sick rate is exceptionally high. He decides whether volunteers who wish to serve at their own expense may be admitted in excess of the establishment, and forwards requests for readmission to active service of retired Officers and officials. Each year he has the unpleasant duty of sending up a list of

Officers who are coming on for promotion but are considered unfitted for the honour : it is also his duty to strike men off the lists after an unexplained absence of a year, if their place of residence cannot be ascertained.

He generally supervises the accommodation prepared and makes propositions for improvements. In his office all routes are made out, and the number of wagons and amount of baggage allowed on the march regulated. He corresponds with the intendance, directing the civil authorities, local military authorities, railway and steamboat administrations, during the transfer of any body of troops under him from one station to another. When the troops are in camp or cantonment near a railway he fixes, by the authority of the chief of the Army Corps, the number of tickets which have to be obligatorily issued as a free pass to soldiers for travelling on the line.

The military and technical training of the arm takes place under his guidance : he is recommended to strain every nerve to improve efficiency in every detail conformably with the exigencies of the service. He draws up the annual course of drills which cannot be regulated on any one single programme for the Empire owing to the great variety of local and climatic conditions. He is generally responsible that all orders and instructions are strictly adhered to, and he is required to aid in the general spread of scientific knowledge throughout the service. In administrative affairs his duty is to certify that all troops receive their just dues both as regards quantity and quality, that the equipment is regularly replaced at the specified periods, that the material and ammunition are in good order, in proper quantity, and ready for use. He may inspect all corps more than once yearly, as well as prisons and hospitals, the chief of the Corps being informed of any irregularities. Lastly, he is authorized to unite batteries and brigades in close cantonments for field manœuvres for fifteen days.

The personnel of the artillery direction at the District is variable : the commandant has usually one or two assistants, while other Officers are often attached for inspection, instruction, administration and technical duties, but the tendency is to reduce this staff to a minimum.

A Field Officer of the artillery usually acts as secretary to the direction, and supervises the routine of business and administrative affairs generally. Secretary, draftsmen, printers, and orderlies complete this personnel. The numbers employed in the various duties range from 14 Officers, 15 officials, and 78 men in the Caucasus to 2 Officers, 2 officials, and 9 men at Orenburg. The territory of the Don Cossacks has a special staff, and is divided into two sections for the recruiting and general service of artillery, with headquarters at Novo-Tcherkask and Oust-Medvieditskaia : at each the staff consists of four Officers.

For the Army Corps the artillery staff consists of 1 Lieutenant-General and 2 other Officers, 4 secretaries, &c. Owing to the absence of Corps artillery in Russia, the functions of this Officer are less than in other great military States, but the tendency is to throw more power and authority into his hands, and make him the really responsible Officer in all matters respecting drill, military education, and troop leading.

All the fighting field artillery in the Army Corps is distributed among the Divisions of infantry and cavalry. The field batteries are generally grouped by brigades of six batteries each, and are divided among the 48 infantry Divisions at the rate of one brigade of artillery to an infantry Division. The horse artillery batteries are not brigaded together, except those which are attached to the Guard cavalry, six in number, one being furnished by the Don Cossacks.

All brigades of artillery have a Major-General for commandant, a brigade Adjutant, paymaster and quartermaster, two surgeons, one veterinary, and 23—24 clerks and orderlies : two 4-horsed wagons are added as the train.

The reserve brigades assume these proportions only on the outbreak of war, while the depôt brigades possess neither train nor horses in peace. The commander of a brigade has the same powers as a regimental chief. If the brigade forms part of an Army Corps he is directly under the artillery chief of the Corps; when attached to an independent division (very rarely the case), he is under the infantry Divisional chief as regards duty, discipline, and training, but in technical matters refers to the artillery chief of the district. This closes the list of commands proper in the artillery. It may be noticed, however, that there is an additional and very important command in war, namely, that of the artillery of the Army; the staff of this command consists of 12 Officers, 4 officials, 8 clerks, and 26 orderlies, &c. The staff of the ammunition park includes a commandant, 2 other Officers, and 16 agents, clerks and soldier servants. Lastly, the communication between the armies and the territory in rear is assured by the "Director of Military Communications of the Army of Operations," whose functions are sufficiently explained by the title.

II. Organization.[1]

A.—*Peace.*

The artillery of the field troops is divided into field artillery, horse artillery, and field parks: each of the two first subdivisions includes a certain number of mountain batteries.

In the regular Army of European Russia, the field batteries are grouped, as a rule, by brigades of six batteries each, and these brigades are attached to the infantry Divisions in the proportion of one brigade to each Division, as already noticed.

The three brigades of the Guard are numbered from 1 to 3. The four brigades attached to the grenadiers are similarly numbered, but the 4th is known as the Artillery Brigade of the Grenadiers of the Caucasus, and has the Grand Duke Michael for its honorary chief. The remaining brigades are numbered from 1 to 41. Of these 48 brigades, 41 belong to the Army of European Russia and 7 to the Caucasus. Forty-two of these 48 brigades have an identical composition, the two first batteries of each of them are *heavy*, that is to say, armed with 4·2-inch guns, 1877 pattern, while the four last are *light*, that is, armed with 3·42-inch guns. In the Caucasus the Grenadier brigade is the only one similarly formed; the remaining 6 have 2 heavy, 2 light, and 2 mountain batteries apiece. To these must be added 3 mountain batteries formed at Kiev in 1885, which do not belong to any brigade; they are no doubt designed, after their war expansion, for use at need against the rampart of the Carpathians.

In peace all field batteries in Europe have only four guns horsed; in Asia and the Caucasus the batteries are as a rule practically on a war footing. Reserving the details for a tabular statement it may be noticed that, as a rule, the batteries in the Caucasus have 8 guns and 2 ammunition wagons horsed in peace, those in Turkestan and W. Siberia, 8 guns, 8 ammunition wagons, and 2 spare gun-carriages, while the 1st and 2nd light batteries of E. Siberia have each 4 light guns and 4 mountain guns horsed, and 19 pack animals for ammunition and spare carriage.

The reserve artillery was first organized in 1876, and underwent modification in 1879 and 1885; at present it consists of 5 brigades each of 6 batteries.

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[1] The tables and general plan of this part of the paper are based upon two articles in the *Revue Militaire de l'Étranger* for 1887.

As these brigades give birth to very complicated formations in war it is necessary to tabulate their composition in order to make clear how fresh units are formed on mobilization.

Reserve Brigade. Peace Units.

	Station.	Heavy batteries, 4 guns.	Light batteries, 4 guns.	Light batteries, 2 guns.	Light batteries, with 2 field and 2 H.A. guns.	Light batteries, with 2 field and 2 mountain guns.	Total.
1st Brigade..	Muraviev .. (Novgorod)	1	1	3	1	..	6
2nd Brigade .	Serpakhov..	1	2	2	1	..	6
3rd Brigade .	Smolensk...	1	1	3	1	..	6
4th Brigade .	Kursk	1	2	1	1	1	6
5th Brigade .	Taganrog ..	1	1	2	1	1	6

Up to a recent date the old bronze 9- and 4-prs. were still in the hands of these batteries; this old material is now, however, being replaced by the 1877 pattern guns.

Every battery of reserve artillery keeps up all material, harness, and stores required for the mobilization of the units which it forms on mobilization.

The artillery of the depôt troops was also reorganized in 1885: at present it only includes two light batteries stationed at Dünaburg. The formations designed in this depôt artillery on mobilization are important, and will be presently described. The horse artillery batteries are not brigaded together with the exception of those of the Guard, six in number, including a Don Cossack battery; all the remainder are distributed among the cavalry Divisions, at the rate of 2 batteries to each Division of 24 squadrons.

As already noticed there are 5 regular horse artillery batteries of the Guard and 23 of the line, while 8 Don Cossack, 2 Terek, and 2 Kuban batteries also share in this divisional distribution.

Thus forty horse artillery batteries are permanently attached to the cavalry Divisions in peace; outside this organization six batteries remain over for new formations, namely, the 5th Kuban battery, the 3 Orenburg, and 2 Transbaikal batteries.

The 28 Guard and line batteries have each six 3·42-inch guns organized in three divisions in peace and war. During peace the 18 batteries with the cavalry on the western frontiers (3rd Guard, 3rd to 13th and 18th to 23rd) have 2 ammunition wagons horsed; the remaindor have only their guns horsed and the number of draught horses reduced to 40.

The so-called "irregular" artillery includes 20 horse artillery batteries in peace and 40 in war. The following table shows the composition of these:—

Cossack Artillery. Units in Peace and War.

Units.	Peace.		War.	
	Guns.	Wagons.	Guns.	Wagons.
1 Battery Don Cossacks of the Guard	6	..	6	12
3 „ „ of 1st line.....	6	2	6	12
4 „ „ „	6	..	6	12
14 „ „ 2nd line	3	..	6	12
1 „ depôt Don Cossacks	..	..	4	1
5 „ Kuban Cossacks	4	2	6	12
2 „ Terek „	4	2	6	12
2 „ Orenburg „	4	2	6	9
1 „ „ „	6	3	6	9
3 „ „ „	..	..	6	9
1 „ „ Cossack depôt.....	..	..	4	..
2 „ Transbaikal Cossacks	4	2	6	9
1 „ „ „	..	..	6	9

The batteries in each Cossack territory are united in brigades except in the Don *voisko*. The brigade does not correspond, however, to any analogous tactical unit in other arms, like the cavalry Division; the grouping has been adopted merely to better centralize affairs connected with the artillery of the *voisko*. The brigade commandant is directly under the Sub-Ataman of the territory, who is himself under the chief of the District. Cossack batteries forming part of cavalry Divisions come under the staff of these Division tactically, but in technical matters refer to their Corps artillery chief. Lastly, there is the arm peculiar to Russia, namely, horse mountain artillery: of this service there is one battery in Turkestan and another in W. Siberia. These batteries are being rearmed with the 1883 pattern 2·5-inch guns, adapted, like Baranovski guns of the same calibre, or the older 3-prs., to pack transport or use on wheels: in peace the Turkestan battery is practically on a war footing, but that of W. Siberia has only 2 guns and 2 wagons.

The table on p. 227 shows, at a glance, the elements which constitute the field and horse artillery of the Russian Army in peace, and go to make up, in conjunction with the Cossack batteries, the field artillery proper.

The question of field parks marching with the army, of reserve depôts to feed these, and generally of the supply of ammunition by a practical organization determined in advance, has been most carefully studied in Russia, and is worthy of notice.

The whole service may broadly be divided into two main divisions, namely, the marching parks and the depôts in rear; all the elements which assist in renewing the supply of ammunition are included in one or other of these. The field parks were formerly divided into two categories, namely, *flying parks* and *mobile parks*. The first were also subdivided, according to the arm of the service whose wants they supplied, into Divisional flying parks for the infantry and sections of flying parks marching with the cavalry Divisions or rifle brigades.

There existed, up to the reorganization of 1886, 48 flying Divisional parks, corresponding to the number of infantry Divisions of the Guard and the line. Each park had 5 sections, 3 for artillery and 2 for infantry ammunition; 23 sections of cavalry flying parks and 7 for the rifles also existed. The

Field Artillery. Peace Units.

	Brigades.	Batteries.				Total.
		Heavy.	Light.	Horse.	Mountain.	
Field Artillery.						
Artillery of the Guard	3	6	12	..	..	18
„ „ Grenadiers..	4	8	16	..	..	24
„ „ line.....	41	82	152	..	12[1]	246
„ of Turkestan.....	1	2	3	..	2[2]	7
„ „ W. Siberia	1	..	3	..	1[3]	4
„ „ E. Siberia.....	1	..	2	..	2[4]	4
Kiev batteries	..	..	..	..	3	3
	51	98	188	..	20	306
Horse Artillery.						
Artillery of the Guard	1	..	..	6[5]	..	6
„ „ line.....	..	..	..	23	..	23
„ „ Don Cossacks	..	..	..	7	..	7
„ of Kuban.....	..	..	..	5	..	5
„ „ Terek	..	..	..	2	..	2
„ „ Orenburg.....	..	..	..	3	..	3
„ „ Transbaikal	..	..	..	2	..	2
„ „ Turkestan	..	..	..	..	1	1
„ „ E. Siberia.....	..	..	..	..	1	1
	1	..	..	48	2	50

second category, or mobile parks, were 14 in number, each of 4 sections or 56 in all. Communication between these various parks and the permanent establishments of the artillery was effected either directly or by means of reserve depôts established only on the outbreak of war.

An order of the 6th June, 1886, modified this system considerably. Each infantry Division, with its artillery brigade, has now a flying park in time of peace. The material of this park is so organized that it can form in war two infantry ammunition parks of 24 wagons each and two parks of artillery ammunition each of 48 wagons. Thus the flying park of the peace footing becomes in war a flying brigade of parks.

The sections of flying parks for cavalry and rifles were abolished by the same order.

The mobile parks number 56 fractions as before, but no longer retain the the name of "sections," nor are they now divided into 14 parks. They are now simply called mobile parks and numbered from 1 to 56. These are distributed as follows :—

[1] 5th and 6th batteries of the 13th, 19th, 20th, 21st, 38th, and 39th brigades.
[2] 6th and 7th batteries. [3] 3rd battery. [4] 3rd and 4th battery.
[5] Including one Don Cossack battery.

4 at St. Petersburg.
4 at Dünaburg.
12 at Bobruisk.
4 at Brest-Litovski.
8 at Kiev.
8 at Krementchoug.
4 at Kursk
8 at Moscow.
4 at Tiflis.

These parks have a double duty in war. Part are intended for the active troops and serve to replenish the flying parks in war and to form the connecting link between these and the depôts established in rear of the active army; the remainder are told off to the reserve infantry Divisions which they supply in the same way as the flying parks do the active Divisions. In order to fulfil this double duty the mobile parks are given to the Army Corps in the proportion of one park to two Divisions. Since, however, several Corps have three Divisions, this organization is somewhat deficient of uniformity. In the formations of reserve the infantry Divisions formed from elements of the first line, that is, with the reserves of the active army, have two mobile parks, while those composed of elements from the second line have only one. The personnel belonging to these parks is kept up at the artillery depôts of the military districts, and are called sections of mobile parks of the Military District.

Besides these flying and mobile parks, 76 local artillery parks are maintained in Europe and 8 in the Caucasus, numbered from 1 to 84, but no cadres are maintained for these in peace, although the necessary material is kept in store. In war these parks are detailed at the rate of one to every two infantry Divisions, their duty being to fill up the mobile parks from the nearest field ammunition depôts.

Both flying and mobile parks are recruited from the annual contingent, in the same way as other corps and branches of the Service. In war they will probably be completed by men of the cavalry and field artillery reserve according to the scheme drawn up by the Headquarter Staff. All the cadres for the flying parks are placed under the chief of artillery of the Military District; they look after all material and stores necessary for mobilization; the commander keeps a plan of mobilization always ready, the Officers required for each park of the brigade being detailed in peace and acquainted with the plan of mobilization; for the mobile artillery parks only a small number of storemen are kept up in peace.

This completes the list of the artillery of the field army and the services directly connected with it.

Summing up the various data which have been given, it appears that *the Russian Field Army on a peace footing has* 395 *batteries*, namely 103, heavy, 221 light, 49 horse, and 22 mountain batteries, *with a total of* 1,610 *horsed guns.*

Lastly, there is the fortress artillery, a perfectly distinct and separately organized body. This arm has undergone perpetual reforms during the last few years, and at present numbers 50 battalions of 4 companies each, with the exception of two battalions, which have 5 companies each, and two which have 3 companies. These battalions bear the name of the fortress where they are located, and are numbered separately for each fortress: in war the siege train would be manned by detachments from these batteries, The distribution of the battalions is as follows:—

Fortress Artillery Distribution.

Fortress.	No. of battalions.	Fortress.	No. of battalions.
Cronstadt	6	Brest-Litovski	4
Viborg	2	Kiev and Dubno	2
Sveaborg	2	Bender	1
Dünamünde	1	Otchakov	1 (5 companies)
Dünaburg	2	Sebastopol	1 (5 „
Kovno	2	Kertch	2
Ossovetz (Goniondz)	2	Mikhailovsk and Poti	1½
Novo Georgievsk	6	Alexandropol	1
Warsaw	6	Kars	2½
Ivangorod	4	Terek-Daghestan	1

In 1876 the fortress artillery underwent a partial transformation. It was desired to endow this service with a more suitable organization ; to do away with certain very glaring defects, and to place it, if practicable, on a level with field artillery as regards its special characteristics and technical training. Before this date the effectives were quite insufficient for the duties incumbent upon the service, nor were they at all determined by the armament of the fortresses, since the guns of these were worked partly by artillerymen and partly by infantry—a method which answered well enough in the old days of smooth-bores, but was found quite unsuitable when the heavy and complicated mechanism of rifled guns came into use, requiring considerable skill and scientific handling in order to produce their full effect. The peace effectives were barely enough for the needs of current service and the care of material, the time occupied in these duties leaving scant leisure for instruction in artillery drill. Again, the proportion of Officers to men was only half that admitted as the due quantity in the field artillery. In 1861 an effort had indeed been made to improve the status of the fortress artillery, and Captains of field artillery, before receiving the command of their batteries, had been regularly placed at the head of fortress companies. But the result was the contrary of what was anticipated : these Officers proved out of touch with the Service, and were pupils instead of instructors : they were strangers to their men, the system was in fact a pernicious one, since the changes in command were perpetual and most prejudicial to the interests of the Service. The appointments were so transitory that Officers took little trouble with the men and their training. As regards the first of these many defects, the organic laws of 1874 greatly improved matters by radically altering the status of the fortress infantry and substituting skilled artillerymen for unskilled infantry. Again, the numbers of men required for each fortress were calculated on exact instead of empirical data ; the number of servants for each gun of the armament was reckoned up as well as the numbers required for other duties of the garrison. It will be useful to notice the principles upon which these numbers were ascertained, so that in case the armament of a place be known, the number of fortress artillerymen can be guessed at, and *vice versâ*. For a land or continental fortress, as it is termed in Russia, the guns are classed in three categories, namely, those for permanent use against the batteries of the attack, next those for special service, including guard armament, guns for interior retrenchments and sortie purposes, and lastly reserve guns. Taking the all-round armament, 1 non-commissioned officer and 5 men are allowed per gun : for those in the first category, namely, guns for

permanent use, 15 men per gun are allotted to insure reliefs and repose: for guns of the second category only 5 men per gun are allowed. Each gun in the armament of a fortress requires 10·2 men for regular service.

For the landward defences of a coast fortress the same principles are followed out, but for each gun on the sea fronts only 7 men and 1 non-commissioned officer are allowed, it being considered that the action of these guns will be only short and intermittent, being provoked by the approach and attack of a hostile fleet. For all other duties 3 men per gun are allowed: each piece of a maritime stronghold will require, as a rule, 10·9 men.

The next step was to fix the total number of combatants required. It was evident that the needs of the Service must be satisfied in peace and war, that a cadre must be formed of sufficient strength to expand quickly to a war footing, while a sufficient reserve was no less essential. Taking all these requirements as a basis for calculation, it was reckoned that 81,000 combatant fortress artillerymen were required for the various fortresses which were only projected at the time of the reforms, but are now fairly complete; this number, it must be remembered, corresponded with the simultaneous preparation of the whole of the strong places. Such a case actually took place during the Crimean War, but it would be very exceptional: no country has attempted to take such a vast deployment as a means for calculating its defenders. In order to obtain a more certain basis for calculation, the hypothesis of several wars and alliances was discussed, and in each case the number and nature of the strong places to be kept up at full strength and at a reduced establishment was studied. This fresh calculation produced the number 54,000, but since it was felt that the limits of the theatre of war might at times extend beyond all anticipation, it was determined to organize so as to obtain 60,000 men in readiness for war. Since, again, active service meant at this time four years' liability, 20,000 men had to be kept on foot in peace, or treble the number under the old organization.

Officers being no less a difficulty in this Service than in others, it was not found feasible to increase the proportion of these to the men above 1 to 60: the number of non-commissioned officers was fixed in the proportion of 1 to 12 men. On the other hand, a great advance was made by permanently dividing the field from the fortress artillery—a step necessitated, beyond a shadow of a doubt, owing to the special and very extensive knowledge required in each branch, only to be learnt by permanent duty in one or the other. As regards the particular formation by battalions, not much need be said: it appeared suitable from an administrative standpoint; it also fell in with the company system which seemed advisable for duties in certain sections of defence, and there appeared no great advantage in adopting the regimental organization which would add to the expense without increasing efficiency.

There are three siege parks in the Empire, two in European Russia and one in the Caucasus, permanently formed as regards material, although always liable to alteration. In each European park[1] there are 424 pieces of ordnance, namely:—

60 6″ heavy rifled B.L. steel guns.
144 6″ light rifled B.L. bronze guns.
116 4·2″ rifled steel B.L. field guns.
12 8″ screw rifled B.L. guns.
40 8″ rifled B.L. howitzers.
40 6″ „ „
12 9″ screw R.B.L. howitzers.

[1] The composition of these parks was changed in 1887. Compare "The Armed Strength of Russia," p. 424.

The Caucasus siege park is on a smaller scale and consists of only 230 pieces, namely, 126 guns and 104 howitzers.

The two European parks have each 12 and the Caucasus park 10 sections; ammunition being carried, according to the regulations, at the rate of 1,000 rounds for every gun and howitzer: in all 1,088 tons of powder are supposed to be taken into the field by a European siege park.

During peace these three parks are located as follows:—

No. 1, 5 sections at Novo-Georgievsk, 5 at Brest-Litovski, and 2 at Dünaburg.

No. 2 at Kiev.

No. 3 at Alexandropol.

Speaking generally, No. 1 is for use against Germany's north-eastern frontier, No. 2 for Galicia and the Austro-Roumanian frontier generally, No. 3 for Asiatic Turkey, Persia, or Afghanistan.

In peace the material only of these parks is kept up: 5 Officers and 10 storemen form the peace cadre: all the siege park ordnance is kept distinct from that of the fortress where the section may chance to be located. In war, besides the personnel of the direction, the material, park, laboratory, &c., there are six battalions of fortress artillery attached. It has been objected that this duty will unduly weaken the particular fortress whence these troops are drawn, but in reality there is no danger, for the siege train would only come into play in an offensive campaign when there would be no necessity for maintaining all the strong places at a full complement.

It must be repeated that the number, category, and calibre of guns forming the normal siege train, as well as the number of projectiles, can only be given as a rough guide: they are liable to change with the necessities of each case, the armament of the hostile works, the season, and other causes: they are decided by agreement between the general direction of artillery and engineers. For each park a certain number of carriages and sets of harness are kept ready: in general it may be noticed that sections 1 and 2 of the parks are destined to aid the first operations of investment, and in certain cases to proceed with bombardment; the eight following sections are for the operations of a regular siege, and the two last for reserve to replace losses. In the Caucasus the first four sections are on the lighter principle, that is to say, organized mainly for investing and the earlier operations of a siege; sections 5 to 8, inclusive, are for the regular duties of a siege, and 9 to 10 the reserve.

In each war the General commanding has the duty of deciding upon the distribution of guns in the sections, the proportion of projectiles for each gun, the quantity of powder, wagons, horses, wall guns, repository machines and accessories, tools, &c., so that the normal distribution of calibres in these sections can only be taken as a guide.

At Alexandropol the pieces are under the charge of one of the commandants of the fortress artillery battalions at Alexandropol, whose battalion then forms the normal peace cadre for the service of the siege artillery of the 3rd or Caucasus park.

The whole service of fortress artillery is controlled and regulated by inspectors who are responsible for efficiency.

In addition to the fortress artillery battalions, there are seven independent fortress artillery companies:[1] two at St. Petersburg, and the remaining five in Asia at Vladivostock, Perovsk, Tashkent, Samarcand, and Vernoe; while, lastly, there are three detachments at Odessa, Askhabad, and at Nikolaievsk at the mouth of the Amur.

[1] A company is to be formed at Bobruisk this year.

Heavy and Light Batteries. Peace Strength.

	Heavy batteries.					Light batteries.							
	Guard.	Grenadiers and line.		Turkestan.		Guard.	Grenadiers and line.			Turkestan.	W. Siberia.		E. Siberia.
			38th & 39th Brigades.	1st Battery.	2nd Battery.			4th Battery, 19th Brigade.	38th & 39th Brigades.		Batteries, 1-2.	4th Battery.	
Officers[1]	6	6	6	6	6	6	6	6	6	6	6	6	6
Combatants	195	195	195	237	237	167	167	167	167	205	212	212	212
Non-combatants	13	13	13	22	22	13	13	13	13	22	22	22	22
Horses: Officers' chargers	5	5	5	5	5	5	5	5	5	5	5	5	5
Horses: Troop	12	11	17	17	17	12	11	18	17	17	17	17	17
Horses: Draught	27	27	66	115	27	27	27	71	66	115	120	83	67
Horses: Train	6	6	6	8	6	6	6	18	6	8	8	14	14
Guns	4	4	8	8	4	4	4	8	8	8	8	8	8
Wagons	..	..	2	8	..	..	..	8	2	8	8	4	8

[1] The 1st and 2nd Batteries of the Field Brigades of Guard and Army have one Captain in addition for batteries formed on mobilization.

In 1885 five field-fortress or "sortie" batteries were raised and are now stationed at Warsaw, Novo Georgievsk, Brest-Litovski, Ivangorod, and Kovno.

Those who require to know the detail of ranks, &c., in the batteries will find full data in the work of the Intelligence Department on "The Armed Strength of Russia." In the following tables many of these details have been purposely omitted in order to direct attention more to the general question of organization.

The table on p. 232 shows the effectives of heavy and light batteries :—

Thus all heavy batteries have the same effectives, and all have only 4 horsed guns : the 4 heavy batteries of the 38th and 39th Brigade, stationed in the Tiflis Government, are an exception and have 8 guns and 2 wagons.

All batteries in Turkestan are practically on a war footing, but the 1st heavy battery has 8 guns, 8 wagons, 1 spare carriage, and 1 train wagon, while the 2nd has 4 guns only.

All light batteries are similarly composed, except the 4 batteries of the 38th and 39th Brigades, which have 8 guns and 2 wagons, like their heavy batteries.

The 19th Brigade, stationed at Armavir in the Kuban territory, has one of its batteries, the 4th, detached in the Transcaspian province : this battery has 8 guns, 1 spare gun carriage, and the battery train at war strength. The 3 Turkestan and 3 W. Siberian batteries have all 8 guns apiece ; the 2 E. Siberian batteries 4 light and 4 mountain guns each.

The table on p. 234 shows the effectives of the horse artillery batteries :—

The horse artillery batteries are usually of 6 guns in peace and war, but they do not all possess the same number of carriages. Thus of the 5 regular batteries of the Guard only 1 has 2 wagons, while the 4 others have their guns only. Similarly in the 23 line batteries 14 have only 2 wagons, and the 9 others have none.

The Kuban and Terek Cossack batteries have 4 guns and 2 wagons, as also have those of the Transbaikal Cossacks. As an exception the 4th battery of the Kuban horse artillery brigade employed in Transcaspia has 6 guns and 6 wagons horsed. The Orenburg batteries have 6 guns if stationed in Turkestan, and 4 if in Europe : in each case they have 2 wagons horsed.

The table on p. 235 shows the effectives of the mountain batteries :—

Thus only three of all these batteries have at present the new steel gun,[1] the remainder have the old pattern bronze. All the mountain batteries carry their material on horseback, except the 6th battery of the Turkestan brigade, the so-called "steppe battery," which has its material on wheels.

It has been noticed that only the flying parks and the sections of mobile parks have a peace cadre ; for the former these include 3 Officers, 67 combatants, 9 non-combatants, and 6 train horses. The sections of mobile parks have different numerical strengths, but average 2 to 3 Officers, and 30 to 90 men.

Collecting together the preceding data, the whole of the elements which constitute the field artillery in peace can now be tabulated.

[1] The manufacture of the new 2·5″ steel mountain guns is, however, so far advanced that all batteries could probably be quickly armed with the new weapon.

Horse Artillery Batteries. Peace Strength.

	Guard.		Line.				Don Cossack batteries.			Kuban and Terek Cossacks.		Orenburg Cossacks.		Batteries of Transbaikal Cossacks.
	With wagons.	Without wagons.	Nos. 1, 3, 5, 7, 9, 11, 13, 15, 16, 17, 18, 19, 20, 21.	Nos. 2, 4, 6, 8, 10, 12, 14, 22, 23.	With wagons.	Without wagons.	Guard.	With wagons.	Without wagons.	Even numbers.	Odd numbers.	In Kazan district.	In Turkestan.	
Officers	5	5	5	5	Effectives are the same as batteries 1, 3, 5—21, or batteries 2, 4—23.		5	7	7	5	5	10	10	6
Officials	..	..	2	..			..	..	..	..	2	1	..	2
Combatants	170	170	168	167			167	180	180	132	132	180	127	133
Non-combatants	15	15	18	15			19	30	30	20	25	29	16	15
Horses: Officers' chargers	4	4	No. of horses and wagons is the same as for the 14 batteries with wagons or the 9 without		4	4	5	7	7	5	5	11	11	7
Horses: Troop saddle	98	98			98	98	88	96	96	71	71	98	65	67
Horses: Artillery draught	53	40			53	40	40	53	40	40	40	53	36	40
Horses: Train	6	6			6	6	6	6	6	4	4	6	6	6
Guns	6	6			6	6	6	6	6	4	4	6	4	4
Wagons	2	..			2	..	..	2	..	2	2	2	2	2

Mountain Batteries. Peace Strength.

	Mountain batteries.												Horse mountain batteries.	
	13th Brigade.	19th Brigade.	20th Brigade.	21st Brigade.		38th Brigade.		39th Brigade.	Turkestan Brigade.		W. Siberian Brigade.	E. Siberian Brigade.		Kiev Batteries.	Turkestan Brigade.	W. Siberian Brigade.
	6th and 6th Batteries, 3-pr. bronze.	6th and 6th Batteries, 3-pr. bronze.	5th and 6th Batteries, 3-pr. bronze.	5th Battery, 3-pr. bronze.	6th Battery, 3-pr. bronze.	5th Battery, steel, 2·5″.	6th Battery, 3-pr. bronze.	5th and 6th Batteries, 3-pr. bronze.	6th Battery, wheeled, 3-pr. bronze.	7th Battery, steel, 2·5″.	3rd Battery, 3-pr. bronze.	3rd Battery, steel, 2·5″.	4th Battery, bronze, 3-prs.			
Officers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Combatants	137	137	137	137	233	137	137	137	153	233	233	182	182	137	132	49
Non-combatants	13	13	13	13	13	13	13	13	13	13	13	13	13	13	14	7
Horses: Officers' chargers	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Horses: Troop	2	2	2	2	2	2	2	2	2	2	2	2	2	2	76	24
Horses: Pack or artillery draught	22	22	22	22	70	53	44	44	45	59	70	76	66	22	46	16
Horses: Train	6	6	6	6	65	6	6	6	6	6	14	14	14	6	6	..
Guns	4	4	4	4	8	8	8	8	8	8	8	8	8	4	6	2

Peace Units and Effectives. Russian Field Artillery.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.	
						Officers' chargers.	Troop horses.	Draught, artillery or pack.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
Guard.												
6 Heavy batteries	36	..	1,170	78	1,248	30	72	162	36	300	24	..
12 Light batteries	72	..	2,004	156	2,160	60	144	324	72	600	48	..
5 Horse artillery batteries	25	..	850	75	925	20	490	213	30	753	30	2
1 Don Cossack battery	5	..	167	19	186	5	88	40	6	139	6	..
	138	..	4,191	328	4,519	115	794	739	144	1,792	108	2
Line.												
86 Heavy batteries	516	..	16,770	1,118	17,888	430	916	2,322	516	4,214	344	..
4 Batteries (38th and 39th brigades)	24	..	780	52	832	20	68	264	24	376	32	8
163 Light batteries	978	..	27,221	2,119	29,340	815	1,793	4,401	978	7,987	652	..
1 Battery (19th brigade)	6	..	167	13	180	5	18	71	18	112	8	..
4 Batteries (38th and 39th brigades)	24	..	668	52	720	20	68	264	24	376	32	8
	1,548	..	45,606	3,354	48,960	1,290	2,863	7,322	1,560	13,065	1,068	16

Peace Units and Effectives. Russian Field Artillery—continued.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.	
						Officers' chargers.	Troop horses.	Draught, artillery or pack.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
Line—(continued).												
23 Horse artillery batteries	115	28	3,855	287	4,242	92	2,254	1,102	138	3,586	138	28
15 Mountain batteries	90	..	2,253	195	2,448	75	30	475	149	729	80	..
	205	28	6,108	482	6,690	167	2,284	1,577	287	4,315	218	28
Cossack Artillery.												
7 Don horse artillery batteries	49	..	1,260	210	1,470	49	672	319	42	1,081	42	6
5 Kuban	25	6	660	115	775	25	355	200	20	600	20	10
3 Orenburg	30	1	434	61	495	33	228	125	18	404	14	6
2 Transbaikal	12	2	266	30	296	14	134	80	16	240	8	4
Terek	10	2	264	45	309	10	142	80	8	240	8	4
	126	11	2,884	461	3,345	131	1,531	804	100	2,566	92	30

Peace Units and Effectives. Russian Field Artillery—continued.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.	
						Officers' chargers.	Troop horses.	Draught, artillery or pack.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
Turkestan Artillery.												
2 Heavy batteries	12	..	474	44	518	10	34	142	14	200	12	8
3 Light batteries	18	..	615	66	681	15	51	345	24	435	24	24
1 Horse mountain battery 2 Mountain batteries	18	..	519	60	579	15	80	150	18	263	22	..
	48	..	1,608	170	1,778	40	165	637	56	898	58	32
Artillery of W. Siberia.												
3 Light batteries	18	..	636	66	702	15	51	323	30	419	24	20
2 Mountain batteries	12	..	282	20	302	10	26	86	14	136	10	..
	30	..	918	86	1,004	25	77	409	44	555	34	20

Peace Units and Effectives. Russian Field Artillery—continued.

Peace Units and Effectives. *Russian Field Artillery*—continued.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.	
						Officers' chargers.	Troop horses.	Draught, artillery or pack.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
Artillery of E. Siberia.												
2 Light batteries	12	..	424	44	468	10	34	54	28	126	16	16
2 Mountain batteries	12	..	364	26	390	10	4	142	28	184	16	..
	24	..	788	70	858	20	38	196	56	310	32	16
General total of batteries	2,119	39	62,103	5,051	67,154	1,788	7,782	11,684	2,247	23,501	1,610	144
Parks.												
48 Flying divisional parks	144	..	3,216	432	3,648	..	..	..	288	288	..	..
20 Sections mobile parks[1]	40	..	580	20	600	..	..	..	..	..	..	..
12 „ „ „ [2]	36	..	1,044	12	1,056	..	..	..	..	..	..	..
24 „ „ „ [3]	48	..	1,392	24	1,416	..	..	..	..	..	..	..
Total parks	268	..	6,232	488	6,720	..	..	..	288	288	..	..
General total field artillery	2,387	39	68,335	5,539	73,874	1,788	7,782	11,684	2,535	23,789	1,610	144

[1] At St. Petersburg, Dünaburg, Brest-Litovski, Kursk, and Tiflis. [2] At Bobruisk. [3] At Moscow, Kiev, and Krementchug.

The effectives of the batteries of reserve artillery vary with the type on the peace footing: these effectives were laid down in the order of 1885, which reorganized this service. Without going into these in detail, it will be necessary to note the general total of these batteries on a peace footing.

Peace Strength. Reserve Artillery.

	Officers.	Combatants.	Non-combatants.	Total of columns 2 and 3.	Horses.					Carriages.	
					Officers' chargers.	Troop horses.	Artillery, draught and pack.	Train.	Total.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11
5 Heavy batteries.....	55	995	105	1,100	50	55	135	30	270	20	..
7 Light batteries, 4 guns	77	1,197	147	1,344	70	77	189	42	378	28	..
11 Light batteries, 2 guns	121	1,881	231	2,112	110	121	154	66	451	22	..
5 Batteries with 2 guns, horse artillery	55	915	105	1,020	50	160	130	30	370	20	..
2 Batteries with 2 mountain guns	22	342	42	384	20	22	48	12	102	8	4
30 Batteries	330	5,330	630	5,960	300	435	656	180	1,571	98	4

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.				Carriages.	
						Officers' chargers.	Troop horses.	Artillery draught.	Train.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	11	12
2 depôt batteries	22	..	354	42	396	20	43	40	12	6	..
5 sortie batteries	55	..	560	70	630	50	40	70	20	10	..
44 4-company fortress battalions	572	..	19,712	176	19,888	..	..	..	..	..	..
4 5 " "	64	..	2,240	20	2,260	..	..	..	..	..	..
2 3 " "	20	..	672	6	678	..	..	..	..	..	..
2 St. Petersburg companies	10	..	554	4	558	..	..	..	..	..	..
2 companies, Tashkent and Samarcand	10	..	444	4	448	..	..	..	..	..	..
2 " Vernoe and Perovsk	10	..	332	4	336	..	..	..	..	..	..
1 Vladivostock company	5	..	332	2	334	..	..	..	..	..	..
Detachments { Odessa	3	1	99	1	100	..	..	..	..	..	..
Detachments { Nikolaievsk	3	1	99	1	100	..	..	..	..	..	..
Detachments { Askhabad	3	1	102	8	110	..	..	..	..	..	..
2 instruction batteries	11	..	353	13	336	9	109	90	..	12	..
Total local and instruction troops	766	3	25,499	309	25,778	59	149	160	20	22	..

Total	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Officers' chargers.	Troop horses.	Artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
	766	3	25,499	309	25,778	59	149	160	20	388	22	..

Peace Strength of the Russian Artillery.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.	
						Officers' chargers.	Troop horses.	Pack or artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Wagons.
	1	2	3	4	5	6	7	8	9	10	11	12
Active troops	2,387	39	68,335	5,539	73,874	1,788	7,782	11,684	2,535	23,789	1,610	144
Reserve troops.....	330	..	5,330	630	5,960	300	435	656	180	1,571	98	4
Depôt troops	22	..	560	70	630	50	40	70	20	180	10	..
Local and instruction troops..	766	3	25,499	309	25,808	59	149	160	20	388	22	..
General total	3,505	42	99,724	6,548	106,272	2,197	8,406	12,570	2,755	25,928	1,740	148

The two depôt batteries are not similarly formed; one has only 2 guns, the other 4 (2 field and 2 horse artillery).

The five fortress sortie batteries have each 2 guns in peace; their effective is uniform, namely, 11 Officers, 112 combatants, 14 non-combatants, 10 Officers' chargers, 8 troop horses, 14 artillery draught, and 4 train horses.

The effective of the companies of the fortress artillery battalions is 3 Officers, 112 combatants, and 1 non-combatant: the battalion staff has only a single Officer, a Colonel or Lieutenant-Colonel.

The effectives of the independent companies are relatively much stronger than those of the battalions.

Thus each company of the two at St. Petersburg have 250 men; those in Asia are always on a war footing, and number 300 at Vladivostock, 200 each at Tashkent and Samarcand, and 150 each at Perovsk and Vernoe.

Lastly, there are two instruction batteries, one a field battery, the other a horse artillery battery; both are much above the usual peace strength, particularly in horses.

The effectives of all these various categories appear in the table on p. 241.

If now the totals of the preceding tables are added up the sum will give the peace strength of the Russian artillery corps in all its various services and departments. (See p. 242.)

In War.

Of all arms which engage in modern warfare, artillery is the one which has the most complicated operation to undertake on mobilization. Infantry regiments have merely the men to look after, and these after all are animate beings, and assist in the great task to the extent of their ability, not only by appearing when called out, but by assisting in arming, clothing, and equipping both themselves and their comrades. Cavalry again is now maintained so nearly upon the war footing in peace, partly owing to the pressing need for instant action by quick moving bodies, partly owing to the general distrust of reserve cavalry men who have been vegetating in civil life for some time, that it has far fewer stages of preparation to traverse than any other arm.

But artillery in general, and Russian artillery in particular, owing to the very numerous transformations and additions which are designed to take effect only in war, has a peculiarly complicated task set it, a task not indeed above the powers of an arm that in all countries and in all time has been distinguished as much by its devotion to duty as to science, but one that will tax to the utmost limits the power of the arm, with all its science and devotion, to overcome. The Russian artillery, as will presently be shown, has to increase its corps of Officers by one-third in order to satisfy the needs of mobilization; it has further to recall 7 men from the reserve to every 4 in the ranks, to collect 6 horses for every 1 present in peace with the batteries, to equip some 2,300 additional guns, 15,000 wagons, and a vast number of train carriages, and all this in a very short period of time, and without neglecting the manifold other duties with which the corps in all armies has been burdened and oppressed from time immemorial.

In so far as the active or field troops are concerned, the passage to a war footing does not affect the *number* of light and heavy batteries which have merely to complete their individual effectives. The same remark applies to the mountain and horse artillery with certain exceptions; for instance, the three batteries at Kiev double their number on mobilization, while as for the horse artillery a considerable augmentation at once takes place by the aid of the Cossack *voiskos*. The Don supplies seven 2nd line and seven 3rd line bat-

teries, which are numbered from 8 to 21; Orenburg gives three and Transbaikal one.

The artillery parks, whose organization has been already discussed, have a more difficult task set them.

According to the Imperial Order (No. 131), of June, 1886, each flying Divisional park becomes on mobilization a "flying brigade of artillery parks," composed of four flying parks; two of these with 24 wagons apiece carrying the infantry ammunition, and two with 48 wagons each the artillery ammunition. Thus these flying brigades number 48; they have the same number and designation as the brigade of artillery with which they march; in consequence of this organization there are 192 flying parks, numbered "1st or 2nd, &c., flying parks of the —— flying brigade of parks." Nos. 1 and 2 contain the infantry ammunition; each flying park is further subdivided into 2 half parks, 4 quarter parks, and 8 sections.

This is the first and most important means for replenishing ammunition expended by the infantry and artillery of the active army in the field, but the service is increased by the mobile parks which form the 2nd échelon. There are 56 of these, numbered consecutively, and distributed among the Army Corps, as already mentioned, at the rate of 1 to 2 Divisions. At first sight it would appear as if this organization must be amply sufficient, but a little consideration shows that this is not quite the case, while it serves to demonstrate the vast extension required by modern war in the accessory services in rear of a field army.

In the normal "order of battle" of the Russian Army there are 10 Army Corps with 2 Divisions; these, therefore, absorb 10 mobile parks. The remaining 9 Army Corps, which have 3 Divisions of infantry, are given 1 or 2 mobile parks, according to the decision of the Minister of War and the Commander-in-Chief. But besides these first necessary duties, the mobile parks have to act as flying parks for the reserve Divisions of infantry, allowing 2 parks to each Division. There are 24 of these reserve Divisions, and 12 of them are formed from elements of the 1st line; the latter will alone absorb 24; the remainder or Divisions of reserve formed with 2nd line elements are allowed 1 apiece. Hence the requirements of the army may be stated as follows, as far as the mobile parks are concerned:—

10 Army Corps of 2 Divisions each	10	mobile parks
9 „ 3 „ „	9—18	„
24th Infantry Division (Finland)...	1	„
12 1st line reserve Divisions.....	24	„
12 2nd „ „	12	„
	56—65	

The *Revue Militaire de l'Étranger*[1] in its admirable summary of this question seems to have been led to a false conclusion about the employment of these parks, since it argues that the reserve Divisions will first receive their allowance, and that "only 10 will remain for the 9 Army Corps, each of 3 Divisions, and for the 24th Division."

It is evident that the minimum number of mobile parks, 56, was found by allowing one to each Army Corps, irrespective of the number of its Divisions, and further by adding two mobile parks for each infantry reserve Division of 1st line, and one for each of the 2nd line; it is also evident that the logical outcome of this would be to increase the mobile parks to 65, in order to endow the stronger Army Corps with the necessary means of action without disturbing the general plan. This step is in fact a necessity

[1] 1887.

for the harmonious organization of the system of gun and small-arm supply, but it is not reasonable to suppose that the reserve Divisions will be given their parks first and the Army Corps afterwards. It seems far more probable that the fighting troops in the first line will be first supplied, and that the reserve Divisions will be the losers; either, in fact, that nine of the twelve 1st line reserve Divisions will have a single mobile park to act as flying park, instead of two as laid down, or else that these will each receive two, and the remaining four will be handed over to such of the reserve Divisions of 2nd line as have succeeded in effecting their formation.

The local parks, 84 in number, whose material alone exists in peace, are distributed at the rate of one to two Divisions for the army in the field; 64 are told off for the active troops, and 20 the reserve troops. They are forwarded to the theatre of war on demand of the chief of the artillery of the army, and their duties are to fill up the mobile parks from the nearest field ammunition depôts. It is evident that if Russia can succeed in mobilizing these parks, she will be able to make up to some extent for the deficiencies existing in the 2nd line of parks, and to retain a surplus of 41 parks for the projected deployment of *opoltchenie*. Thus it appears that in this highly important service, a service which in this country up to a recent date was conspicuous by its absence, Russia has given proof of forethought and sagacity; if the 1st line organization is a little wanting in levelness, the means of action are on the whole very extensive, and prove, as does nearly every detail of Russian military organization, that if failure ensues in war it will at all events not be due to the want of preliminary care bestowed upon every portion of the organization.

It has been noticed that the artillery reserve troops give birth in war to very extensive formations, and it has been seen that these troops consist in peace of 30 batteries, distributed in groups of 6 among 5 brigades. On a principle similar to that which rules in the reserve infantry the developments assumed on mobilization are to the peace strength in the proportion of 4 to 1, and the reserve artillery is increased from 30 to 120 batteries.

This is effected as follows. In the first three brigades the 1st battery includes 4 heavy guns, and expands to 4 heavy batteries; the 2nd, 3rd, 4th, and 5th batteries expand to 16 light batteries, while the 6th battery, which has 2 field and 2 horse artillery guns, expands to 4 light batteries, one of them being a 2-gun horse artillery "battery." Thus in each of the first three brigades 20 light and 4 heavy batteries are formed, excluding the 2 horse artillery guns in each. In the 4th and 5th brigades, 24 batteries are produced on the same general plan, but owing to the slightly different composition of these brigades in peace, 4 heavy and 19 light batteries are formed in war (the latter including 2 horse artillery guns), as well as 1 mountain battery in each brigade, which is made up by each of the 5th batteries of these two brigades, thanks to the 2 mountain artillery guns they each possess in peace.

In all, therefore, 20 *heavy,* 98 *light, and* 2 *mountain batteries of reserve artillery are so formed.* Of this number, all the heavy and 60 of the light batteries constitute the artillery of the 24 reserve infantry Divisions, and are distributed in 20 brigades of 4 batteries each; 40 batteries remain over for another organization yet to be described. In a very similar fashion the 2 depôt batteries each become 4 batteries in war: the 40 batteries remaining over from the expansion of the reserve brigades are also now called depôt batteries, and are divided into 5 brigades of 8 batteries each; 8 batteries remain over and above this organization. In all, therefore, the 48 depôt batteries consist of 40 light field batteries, 6 light batteries, each including 2 horse artillery guns and 2 mountain batteries.

The horse artillery divisions, or "sections," as they are called in Russia,

go to form depôts of horse artillery, and to these may be added the artillery of the Cossack troops, namely, 1 depôt 4-gun battery, supplied by the Don *voisko* from its available 2nd line elements, and 1 battery of Orenburg Cossacks. In a similar way the mountain batteries constitute the depôts for their service.

No country in the world has attempted such an expansive or extensive artillery depôt system as Russia, none certainly have made arrangements for such a "waste," whether in men or in material, during a campaign. Over 30,000 men, with 50 batteries of 404 guns! This is a whole army of artillery, and yet it is designedly intended, not for overpowering a foe at the outset, for which purpose indeed it is not available owing to its chrysalis condition in peace, but for gradually filling up the gaps caused by campaigning, *more particularly in material.* No country but Russia has really faced the fact that there is a strong probability of great loss of guns, ammunition, and wagons in the next great war, partly because the opposing artilleries will be more evenly matched than has been the case since the days of Napoleon, partly because all artilleries have adopted those forward "tactics" of which Prince Hohenlohe is the great exponent, and intend to throw themselves into the thick of the fight like the other arms regardless of loss. These tendencies and theories are very praiseworthy and excellent, but it is necessary to be prepared for the logical result of them, and this result Russia *is* prepared for by the wise organization of her depôt artillery. Only it will be noticed that Russia has not attempted to create a large reserve of horse artillery; in this she has been wise, for no one can doubt that the thorough efficiency and dash required in this branch of the artillery are incompatible with the humdrum life in a skeleton depôt.

To complete the picture of the war formations it only remains to discuss the development given to the sortie batteries and fortress troops. The 5 sortie batteries expand to 16 in war; the 1st expands to 4 which are destined for the fortress of Warsaw; the 2nd also to 4 for Novo-Georgievsk; the 3rd to 3 for Brest-Litovski; the 4th to 2 for Ivangorod; and the 5th to 3 for Kovno. Attention may be called to the fact that all these are intended for Poland, a proof that defensive action here is contemplated in advance, and for this region in particular, as we do not find sortie batteries in the fortresses opposite Galicia.

The fortress troops, as well as the two instruction batteries, merely complete their effectives from the reserve on mobilization, and do not form any additional units.

The following table (p. 247) shows the result of mobilization as regards the numbers of batteries throughout the Empire.

All heavy batteries in Europe and the Caucasus have the same effectives at a war strength, and the differences which exist in peace disappear. Each heavy battery has 6 Officers, 237 combatants, 22 non-combatants, 5 Officers' chargers, 18 troop saddle horses, 163 artillery draught horses, and 20 train horses, including 2 spare. The material includes 8 guns, 16 wagons, and 1 spare gun-carriage. The train 8 carriages, namely, 5 for the artillery train and 3 for the intendance.

The 2 heavy batteries in Turkestan have a similar composition, except that each raises a 2-gun depôt on mobilization which increases their strength by 46 combatants. There is no regulation train for any of the artillery units in Turkestan or the two Siberias. All light batteries of the Guard, grenadiers, and line have at war strength 6 Officers, 205 combatants, and 22 non-combatants, with 5 Officers' chargers, 18 troop saddle horses, 137 artillery draught horses, and 20 train horses, including 2 spare. The material is 8 guns, 12 wagons, and 1 spare gun-carriage. The train is the same as for the heavy batteries.

War Units. Russian Artillery.

	Brigades.	Batteries.				Total.	Increase from peace strength.
		Heavy.	Light.	Horse.	Mountain.		
Field artillery :—							Batteries.
Guard	3	6	12	..	..	18	..
Grenadiers	4	8	16	..	..	24	..
Line	41	82	152	..	12	246	..
Turkestan	1	2	3	..	2	7	..
W. Siberia	1	..	3	..	1	4	..
E. Siberia	1	..	2	..	2	4	..
Kiev batteries	..	..	..	..	6	6	3
Total	..	98	188	..	23	309	3
Horse artillery :—							
Guard	1	..	..	6	..	6	..
Line	..	..	..	23	..	23	..
Don Cossacks	..	..	..	21	..	21	14
Kuban	..	..	..	5	..	5	..
Terek	..	..	..	2	..	2	..
Orenburg	..	..	..	6	..	6	3
Transbaikal	..	..	..	3	..	3	1
Turkestan	..	..	..	..	1	1	..
W. Siberia	..	..	..	..	1	1	..
Total	..	..	..	66	2	68	18
Reserve artillery	20	20	60	..	..	80	50
Depôt artillery :—							
Batteries from reserve brigades	5	..	38	..	2	40	40
Batteries from two depôt batteries	..	..	8	..	..	8	6
Don Cossacks	..	..	..	1	..	1	1
Orenburg	..	..	..	1	..	1	1
Total	..	..	46	2	2	50	48
Fortress artillery :—							
Sortie batteries	..	..	16	..	..	16	11
Instruction artillery	..	..	1	1	..	2	..
General total	..	118	311	69	27	525	130

The light batteries of Turkestan and the two Siberias have a slightly different composition. In Turkestan there is a 2-gun depôt with 38 men, in W. Siberia, the 1st, 2nd, and 4th batteries have 211 combatants, the 1st and 2nd batteries also raise a 2-gun depôt with 38 men in war. The two light

batteries in E. Siberia, having 4 light and 4 mountain guns apiece, also vary in their composition. These have 6 Officers, 211 combatants, 22 non-combatants, 5 Officers' horses, 17 troop saddle horses, and 67 artillery draught horses; 8 guns, 16 wagons, and 1 spare gun-carriage.

In a similar way all horse artillery batteries have a practically identical composition, but there are here also variations, unimportant in themselves, but which have to be noticed in order to arrive at the real appointed strength of the arm in war.

Thus the Guard batteries have 5 Officers, 183 combatants, 28 non-combatants, 4 Officers' chargers, 99 troop saddle horses, 123 artillery draught horses, and 27 train horses, including 2 spare. The material includes 6 guns, 12 wagons, and 1 spare gun-carriage, the train 11 carriages, 5 for the artillery train and 6 for the intendance. In the line the only variation is the diminution of the combatants by 3, and a corresponding increase in non-combatants in 14 of these batteries, which also number a doctor and veterinary, while in the other 9 batteries the only change is the reduction of 3 combatants.

All batteries of Don Cossacks, whether of 1st, 2nd, or 3rd line, have a similar composition, namely, 6 Officers, 238 combatants, 33 non-combatants, 6 Officers' chargers, 142 troop saddle horses, 120 artillery draught, and 27 train, including 2 spare; the material is on a similar scale to the regular batteries; 44 of the combatants belong to a 2-gun depôt created in war. The Guard Cossack battery has a slightly different organization, as will appear from the "General Total" Table. All Kuban, Terek, Transbaikal, and Orenburg batteries have an identical composition in each separate *voisko;* from whatever "line" their elements are taken. The details appear in the table.

It will be noticed that there is considerable variety in the composition of the mountain batteries, owing to the different composition of their material.

The flying parks are divided into infantry ammunition parks and artillery ammunition parks. The first have 3 Officers, 163 combatants, and 16 non-combatants; there are 4 Officers' chargers, 7 troop saddle horses, 156 artillery draught, including 8 spare and 9 for the train. The carriages number 29, namely, 24 ammunition wagons with 6 horses each, 1 workshop-wagon with 4 horses and 4 2-horse train carts. The artillery ammunition flying parks have each 4 Officers, 300 combatants, 24 non-combatants, 5 Officers' chargers, 7 troop saddle horses, 311 draught, including 15 spare and 15 train. The mobile parks have an almost identical composition to these latter; the local parks have 50 combatants and 4 non-combatants in war, and are commanded by a Captain and Lieutenant.

Counting the spare gun-carriages, as described, under the head of train carriages, and leaving out of consideration the regimental train of Turkestan, the two Siberias, and the mountain batteries, the following is therefore the total effective strength in men, horses, guns, and wagons of the elements belonging to the artillery of the active troops. (See Table.)

In round numbers the batteries with the field troops are commanded by 2,200 *Officers and served by* 91,000 *men. The batteries require* 75,500 *horses, and are armed with* 2,882 *guns supplied from* 4,876 *ammunition wagons which march with the batteries, and* 9,600 *with the parks.* In all, 22,417 horsed carriages are required, 10,069 for the 595 batteries and 11,448 for the parks.

Under the head of reserve troops of the artillery there must be included on mobilization only 80 of the 120 batteries; the remainder coming under the category of depôt artillery.

The sum total of these 20 heavy and 60 light batteries amounts to 480 Officers, 17,040 combatants, 1,760 non-combatants, 400 Officers' chargers, 1,440 troop saddle horses, 11,480 artillery draught and pack, and 1,600 train.

	Officers. 1	Officials. 2	Combatants. 3	Non-combatants. 4	Total of columns 3 and 4. 5	Officers. 6	Troop saddle. 7	
Field Artillery.								
96 Heavy batteries	576	..	22,752	2,112	24,864	480	1,728	
2 Turkestan heavy batteries	12	..	566	44	610	10	36	
180 Light batteries	1,080	..	36,900	3,960	40,860	900	3,240	
3 Light Turkestan batteries	18	..	729	66	795	15	54	
3 Light W. Siberian batteries	18	..	709	66	775	15	54	
2 Light E. Siberian batteries	12	..	422	44	466	10	34	
	1,716	..	62,078	6,292	68,370	1,430	5,146	
Mountain Batteries.								
13 3-pr. bronze batteries	78	..	3,029	871	3,900	65	39	
3 2·5″ steel	18	..	699	201	900	15	9	
1 Turkestan Steppe battery	6	..	155	57	212	5	3	
6 Kiev batteries	36	..	1,338	342	1,680	30	18	
	138	..	5,221	1,471	6,692	115	69	
Regular Horse Artillery.								
5 Guard batteries	25	..	915	140	1,055	20	495	
14 Line batteries	70	28	2,534	434	2,968	56	1,386	
9 Line batteries	45	..	1,620	252	1,872	36	891	
	140	28	5,069	826	5,895	112	2,772	
Cossack Horse Artillery.								
1 Guard battery, Don Cossack	5	..	210	31	241	5	129	
21 Don Cossack batteries	126	..	4,998	693	5,691	126	2,982	
4 Uneven Kuban and Terek batteries	20	8	1,016	160	1,176	28	636	
3 Even Kuban and Terek batteries	15	..	762	108	870	15	465	
6 Orenburg batteries	30	6	1,404	192	1,596	36	852	
3 Transbaikal batteries	15	3	714	93	807	18	426	
1 Turkestan battery	5	..	137	64	201	4	82	
1 W. Siberian battery	7	..	208	51	259	6	110	
	223	17	9,449	1,392	10,841	238	5,682	
Total of batteries	2,217	45	81,817	9,981	91,798	1,895	13,669	5
Parks.								
96 Infantry flying parks	288	..	15,648	736	16,384	384	672	1
96 Artillery flying parks	384	..	28,800	2,304	31,104	480	672	2
56 Mobile parks	224	..	16,800	1,232	18,032	280	392	1
Total of parks	896	..	61,248	4,272	65,520	1,144	1,736	6
General total	3,113	45	143,065	14,253	157,318	3,039	15,405	11

Russian Artillery (Active Army).

Horses.				Carriages.			Increase from peace strength.			
Troop saddle.	Artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Wagons.	Train.	Men.	Guns.	Horses.	Carriages.
7	8	9	10	11	12	13	14	15	16	17
1,728	15,648	1,920	19,776	768	1,536	864	4,896	368	14,886	2,392
36	326	..	372	16	32	2	92	4	172	26
3,240	24,660	3,600	32,400	1,440	2,160	1,620	8,460	700	23,325	3,772
54	411	..	480	24	36	3	114	12	55	..
54	411	..	480	24	36	3	73	12	61	..
34	134	..	178	16	32	2	(– 2)	..	56	..
5,146	41,590	5,520	53,686	2,288	3,832	2,494	13,633	1,096	38,555	6,190
39	1,482	..	1,586	104	182	13	..	..	..	..
9	399	..	423	24	48	3	..	..	..	..
3	55	..	63	8	12	1	..	..	..	..
18	768	..	816	48	96	6	..	..	..	..
69	2,704	..	2,888	184	338	23	3,363	72	1,760	361
495	615	135	1,265	30	60	60	130	..	512	118
1,386	1,722	378	3,542	84	168	168	598	..	2,433	414
891	1,107	243	2,277	54	108	108				
2,772	3,444	756	7,084	168	336	336	728	..	2,945	532
129	133	27	294	6	12	12	55	..	155	24
2,982	2,520	567	6,195	126	252	252	4,221	84	5,114	498
636	572	108	1,344	24	48	48				
465	429	81	990	18	36	36				
852	720	162	1,770	36	72	72	4,346	96	4,902	376
426	360	81	885	18	36	36				
82	57	..	143	6	6	1				
110	84	..	200	8	8	1				
5,682	4,875	1,026	11,821	242	470	458	8,622	180	10,171	898
13,669	52,613	7,302	75,479	2,882	4,976	3,311	26,346	1,348	53,431	7,981
672	14,976	864	16,896	..	2,304	480	43,840	..	49,056	7,968
672	29,856	1,440	32,448	..	4,608	864				
392	17,416	840	18,928	..	2,688	504	14,960	..	18,928	3,192
1,736	62,248	3,144	68,272	..	9,600	1,848	58,800	..	67,984	11,160
15,405	114,861	10,446	143,751	2,882	14,576	5,159	85,146	1,348	121,415	19,141

The material includes 640 guns, 1,040 ammunition wagons, and 720 train carriages. This amounts to an increase above the peace strength of the 30 reserve batteries of 150 Officers, 11,710 combatants, 1,130 non-combatants, 100 Officers' chargers, 1,005 troop saddle horses, 10,824 artillery draught and pack animals, and 1,420 train, with 542 guns, 1,036 ammunition wagons, and 720 train carriages.

It is unnecessary to again discuss the elements which go to compose the depôt artillery, and it will be sufficient to tabulate the war effectives and notice what expansion takes place in order to gain some idea of the strain upon the service on mobilization.

The depôt artillery consists then in war of the following elements (p. 250).

It has been noticed that the 40 light batteries come from a development of the reserve artillery; for the rest of the above formations the only peace cadre consists of the 2 depôt batteries; practically then the whole of the men, horses, and material existing in peace have to be quadrupled on mobilization by both reserve and depôt artillery.

Thus the general design for artillery organization in Russia appears clearly. In the field troops one man is recalled from the reserve to every three or four with the batteries, the number of guns horsed in peace has to be doubled in war, except by the regular horse artillery, which does not need an increase; two horses have to be requisitioned for every one in the ranks, and a train has to be created *ab ovo*. This is for the field troops only. For the 2nd line troops 32 peace batteries expand into 130 batteries; the field troops may indeed be able to complete their guns in good time under ordinary conditions, but the same result will be achieved in the 2nd line formations with difficulty.

To complete the picture it only remains to give a glance at the war effectives of what some writers include under the general head of "local" artillery, under which heading are included sortie and instruction batteries, companies and detachments.

The 16 sortie batteries have 8 guns and 2 ammunition wagons in war, each of 6 Officers, 128 men, and 73 horses. The companies of fortress artillery have their cadres increased from 3 to 5 Officers and their combatants to 327. The independent companies in Asia (Vladivostock, &c.) retain their peace strength: the two St. Petersburg companies expand to 442 men each; the Odessa, Nikolaievsk, and Askhabad detachments are unchanged. The war strength becomes as shown in table on p. 251.

In the case of the local artillery, therefore, the men in the batteries and battalions are to the reserve recalled on mobilization in the proportion of 3 to 5, which appears reasonable, given the advanced system for fortresses for which these troops are intended; on the other hand, the number of horsed guns to those not horsed is in the proportion of 1 to 3, which appears altogether insufficient, given the pressing calls there will be for horses from services which will have a prior claim to these "local" or garrison troops.

The war effectives of the whole artillery service can now be summed up in a table which requires no comment (p. 252).

From these tables and statements it results that *the Russian artillery requires on mobilization the addition of* 1,820 *Officers and officials*, 171,918 *men*, 137,019 *horses, while the extra material required amounts to* 2,328 *guns*, 15,531 *ammunition wagons, and* 5,800 *carriages.*

Details of the various establishments of batteries, together with a description of clothing, armament, and equipment of the men are given in great detail in "The Armed Strength of Russia,"[1] and these matters will not be referred to at length.

[1] Pp. 75 to 100.

War Strength. Depôt Artillery.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.		
						Officers.	Troop saddle.	Artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Wagons.	Carriages.
	1	2	3	4	5	6	7	8	9	10	11	12	13
40 Light batteries....	400	..	23,880	520	24,400	360	240	1,040	80	1,720	320	80	..
6 Light batteries with 2 horse artillery guns	84	..	5,106	108	5,214	78	354	276	18	726	60	18	..
2 Mountain batteries .	20	..	1,194	26	1,220	18	6	44	4	72	16	8	..
1 Don horse artillery battery	6	2	88	12	100	6	46	32	..	84	4	1	..
1 Orenburg horse artillery battery	3	..	48	3	51	3	44	26	..	73	4	..	..
	513	2	30,316	669	30,985	465	690	1,418	102	2,675	404	107	..

War Strength. Local Artillery.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.		
						Officers' charges.	Troop saddle.	Artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Ammunition wagons.	Carriages.
	1	2	3	4	5	6	7	8	9	10	11	12	13
16 Sortie batteries	96	..	1,952	128	2,080	80	128	396	64	1,168	128	32	..
2 Instruction batteries	5	..	180	28	208	4	99	123	27	253	6	12	12
	6	..	205	22	227	5	18	137	20	180	8	12	9
44 Battalions, 4 companies each	924	..	57,552	176	57,728	..	..	..	..	..	..	..	..
4 „ 5 „ „	104	..	6,540	20	6,560	..	..	..	..	..	..	..	..
2 „ 3 „ „	32	..	1,962	6	1,968	..	..	..	..	..	..	..	..
2 St. Petersburg companies	10	..	884	4	888	..	..	..	..	..	..	..	..
2 Tashkent and Samarcand companies[1]	10	..	444	4	448	..	..	..	..	..	..	..	..
2 Vernoe and Perovsk companies	10	..	332	4	336	..	..	..	..	..	..	..	..
1 Vladivostock company	5	..	332	2	334	..	..	..	..	..	..	..	..
Detachments Odessa	3	1	99	1	100	..	..	..	..	..	..	..	..
Detachments Nikolaievsk	3	1	99	1	100	..	..	..	..	..	..	..	..
Detachments Askhabad	3	1	102	8	110	..	..	..	..	..	..	..	..
	1,211	3	70,683	404	71,087	89	245	656	111	1,601	142	56	21
Increase from peace strength	467	..	45,538	117	45,675	30	96	496	91	1,213	120	34	21

[1] Moved here from Tchinaz in 1881.

War Strength of the Russian Artillery.

	Officers.	Officials.	Combatants.	Non-combatants.	Total of columns 3 and 4.	Horses.					Carriages.		
						Officers' chargers.	Troop saddle.	Artillery draught.	Train.	Total of columns 6 to 9.	Guns.	Wagons.	Carriages.
	1	2	3	4	5	6	7	8	9	10	11	12	13
Active troops .	3,113	45	143,065	14,253	157,318	3,039	15,405	114,861	10,446	143,751	2,882	14,476	5,059
Reserve.....	480	..	17,040	1,760	18,800	400	1,440	11,840	1,600	14,920	640	1,040	720
Depôt	513	2	30,316	669	30,985	465	690	1,418	102	2,675	404	107	..
Local	1,211	3	70,683	404	71,087	89	245	1,156	111	1,601	142	56	21
	5,317	50	261,104	17,086	278,190	3,993	17,780	129,275	12,259	162,947	4,068	15,679	5,800

A Russian battery is an administrative as well as a tactical unit, and the duties of its commander are considerable. He has all the rights and duties of a regimental commander in questions relating to instruction, barracks, and mobilization; he is directly responsible for the careful administration of the unit under his command. The artillery commandant of the Army Corps is his immediate superior, through the brigade chief, in all matters concerning material, ammunition, horses, harness, clothing and equipment, and other technical affairs.

In the matter of clothing, a reference to the system pursued by the infantry regiments will be the best guide to the general plan. The State furnishes arms, head-dress, cloth, lining material, and buttons. All clothing, equipment, and harness is made up in the battery shops, and the commander of each unit receives for this purpose a certain sum based upon the effectives of his corps and the time that the materials are calculated to wear.

All other necessities, except flour and oats, are also supplied in cash, that is to say, in paper money, and the battery makes the best of its local markets.

The brigade chief is supposed to exercise a general supervision over these operations; the accounts, made up at the end of the year, are passed by him. Practically, as in the other arms, there is an uncontrolled manipulation of certain funds by those in charge of certain units above and including the battery. While it is probable that the stories of peculation by Russian Officers—as distinct from officials and agents of the intendance—are grossly exaggerated, there is no doubt that in our own Army, so long as the system was pursued, it gave rise to frequent abuses, and there is no reason to suppose that in this matter Russia is greatly in advance of the England of 50 years ago.

All ranks in the Russian batteries are armed with the dragoon sword and with a revolver slung on the waistbelt and secured by a cord round the neck. In peace only 40 revolvers per battery are issued; 120 are kept in store for each depôt and reserve battery; in the parks the dismounted men have rifles.

The entrenching tools carried by a field battery include 32 spades, 24 axes, and 4 picks, besides saws, mattocks, and crow-bars; a mountain battery has a smaller proportion of tools and a depôt battery a smaller quantity again. In the fortress artillery men have Berdan rifles as well as revolvers.

Forage is issued twice a month. The allowance for the line artillery daily is 9 lbs. 5 ozs. of oats, 9 lbs. 1 ozs. hay, and 3 lbs. 10 ozs. of straw, a ration much below what we consider the minimum. After the summer drills all horses are turned out to grass for a month, and hence in October and November are quite unready for campaigning. In the artillery of the Guard this practice is not the rule, while the horses receive a ration of oats more than 3 lbs. in excess of that given to the line. Barley is very frequently substituted for oats in all branches of the Service.

III. Material.[1]

If the question be asked, When did the fact first become prominent that Russia was able to compete successfully in the artillery market with foreign rivals? the answer will probably carry us back to 1873, the year of the great Vienna Exhibition. No one who visited that world's fair can fail to have been struck with the brave show made by the military division of the Russian or XVIth Section.

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[1] I am much indebted to Captain G. V. Kemball, R.A., for carefully revising this part of the work.

This period also is coincident with an epoch when the reign of force was firmly established in Europe, and when the expansive force and vitality of a State began to reckon, not by its light and leading in peaceful arts, sciences, and industries, but in its power and ability to create the most complete, approved, and deadly engines of war for the future annihilation of its neighbours.

Regarded by scientific Europe as more or less outer barbarians, the Russians suddenly disclosed that if the Slav race is distinguished by its imitative faculties, these are at all events of a high order, and aid the people at arriving at exactly the same result as that attained by Western Powers—thanks to the many gifts known among the latter by the various names of "culture," "science," and "creative genius."

Very soon after the last war the old 9- and 4-pounder bronze guns, with flat Krupp wedge, were condemned, since they were deficient in range, accuracy, penetration, and had a very low initial velocity: they failed, in short, in nearly every characteristic demanded from a good model field-gun. Batteries of these guns are still retained by some depôt and reserve corps, but they are rapidly being replaced, and will, in all probability, never see active service again. It is useless, in consequence, to waste time over their description.

Russian artillerymen were well aware of the defects of their armament, and even before the Russo-Turkish War there arose a question of adopting Colonel Lavrov's bronze system. At the time of the declaration of war a new heavy gun was undergoing a series of trials, but by April, 1877, the arsenals were only forward with some 150 guns of the new pattern.

The lessons of the war brought home most forcibly to the Government the folly of a short-sighted economy: an instant transformation of the armament was decided on, but the Government, unable immediately to supply its wants at home, was forced to apply to the foreign market.

After a great number of trials the special commission appointed for the purpose of selecting the gun of the future decided on a Krupp steel field-piece not at all unlike the German field-gun of the 1873 pattern, and a supply of these pieces was in consequence ordered from Essen.

But Russia had no intention of permanently paying toll to Krupp and being at the mercy of foreign enterprise in such an important matter, and active measures were at once taken so that the home arsenals might find themselves in a position to complete the renovation of the material within a period of three years.

Artillery Officers of scientific attainments and engineers skilled in metallurgy were sent abroad to study and report on the installation and machinery of great foreign metallurgic establishments. By the light of the experience so gained the Obukhov works were transformed and enlarged, so that within eighteen months this single arsenal was in a position to complete the required order, and then, gaining confidence from its strength, it obtained the sanction of the Grand Master to a new design on a very similar system of construction, but differing somewhat in detail from the original type selected from Essen.

This latter weapon (Pl. A, Figs. 1, 3, and 4 (vol. Plate 4)), known in Russia as the "field-gun, pattern 1877," consists of a steel tube or body and a single coil or jacket which carries the trunnions and the slot of the wedge. The jacket is expanded by heat and placed over the tube: after cooling it contracts and grips the tube firmly, while a catch formed by two half-rings prevents it from shifting.

The guns (Pl. A, Figs. 2 and 5) designed and made at the Obukhov works and generally known as the "field-gun, 1879 pattern," are composed similarly of an inner tube and an outer jacket, but in the newer type this jacket is con-

tinued right up to the muzzle of the gun instead of ending a little in front of the trunnions as in the original type selected. The trunnions are carried by a trunnion hoop retained in its position by a ring, composed of two half-rings and covered by a hoop. The tube is of Martin-Siemens steel compressed by hydraulic machinery on the Whitworth system at a pressure of 90 atmospheres.[1] The jacket is constructed of puddled steel cast in a crucible, but not subjected to pressure; it carries the slot of the wedge block. The trunnion hoop is of compressed steel, and is heated before it is placed over the jacket. The tube is fitted into the jacket when cold under a pressure of about 30 atmospheres by the help of a special apparatus whose motive power is derived from a hydraulic press worked by two men. The tube is rifled before this operation takes place, and is entirely finished, as also is the jacket over which the trunnion coil has to be fitted.

Since the rearward edge of the tube has to end on a level with the front edge of the slot of the wedge, there is screwed into the jacket in the rear of the slot and in the prolongation of the tube a second small steel tube to compensate for the difference of diameter which is indispensable in order that the large tube may be fitted into the jacket: another screw prevents this from shifting.

The same machinery enables the tube to be withdrawn when cold if it is necessary to repair it or replace it by another. Both these operations are perfectly feasible provided that the surfaces of the two portions have been properly prepared and conveniently adjusted.

This idea of constructing guns with movable tubes was proposed and tried for heavy ordnance so far back as 1876, and is due to General Mousselius and Captain Kolokoltzov, the former being director of technical works at the Obukhov foundry, while the latter is chief of the administrative service at the same institution.

The advantages claimed for this system are that not only can worn-out or damaged tubes be replaced with ease, but also that alterations and improvements can readily be made in the tube and interior arrangements generally, thus keeping on a level with advances in gunnery science, without entailing as a necessary consequence the condemnation of a whole system of ordnance while still in a perfectly serviceable condition.

The breech mechanism (Pl. A, Figs. 7, 8, 9, and 10) of the field-guns, pattern 1877, is identically similar to that of the German field-guns: as far as general principles are concerned it has for Russians the advantage of being on the same lines as for the old bronze guns: the same remark applies equally to the 1879 pattern, although there is a slight and unimportant difference in the latter type. In each pattern the non-modified steel Broadwell ring is used. The bore and interior arrangements are identically the same in each pattern: there is a cylindrical cartridge chamber and lodgment for the obturator in rear of it, the neck of the chamber, the cylindrical projectile chamber, and the bore proper.

The grooves are twenty-four in number for all field calibres, and have the same breadth and depth, the twist being from left to right: these are continued into the projectile chamber with a less depth and only cease at the beginning of the rear neck of the chamber, although in the German guns these terminate at the front neck.

In their exterior appearance the 1877 guns are very similar to those adopted by Germany, and do not show an increasing thickness towards the breech: on the other hand, the 1879 guns finish off with a strengthening hoop rather

[1] The unit of measurement for fluid pressures abroad is the weight of one atmosphere, or 14·7 lbs. per square inch. We use the more complicated expression of "lbs. or tons per sq. inch."

larger in dimensions than the breech end: it is square in section and projects from the jacket: on its upper surface is engraved a line parallel to the axis of the piece and intended for the clinometer. The exterior of all field-guns was originally bronzed, but the rule now is to cover the whole with a coating of black varnish.

The sights (Pl. A, Fig. 6) resemble those of the Austrian service, pattern 1875. The tangent scale is in two parts. It consists of a brass bar or stem, which slides in a brass outer case; the latter works in a wrought-iron bush which is let into the strengthening hoop on the breech of the gun. The tangent scale is cylindrical in section, but a plane face is cut on the rear portion of its surface, and on this face is engraved the scale of distances in sagènes.[1]

For ranges up to 800 sagènes it is not necessary to use the stem of the tangent scale, but to obtain the elevation for longer ranges the stem must be raised and clamped. By this telescopic arrangement one tangent scale serves both for short and long ranges without necessitating the use of a tangent scale of excessive length.

The head of the tangent scale is formed of a graduated horizontal tube: in this tube works a steel traversing screw with a milled head: along it also moves a nut which forms the deflection leaf, and contains the notch of the backsight. The steel foresight is conical in shape and fixed to the upper side of the shoulder of the left hand trunnion: it is painted black to facilitate laying.

The light gun and the horse artillery gun have the same calibre and practically the same range: they also make use of the same ammunition: the cavalry gun is, however, 16 inches shorter and 180 lbs. lighter than what is sometimes called the "infantry" light gun. This advantage is gained at the sacrifice of a certain amount of initial velocity (1,350′ : 1,450′): further, the horse gun has a more curved trajectory, and at practice gives a less satisfactory probable rectangle or cube of mean deviation. As for the heavy or battery gun, an inspection of the tables in the Appendix will show that this weapon is essentially a low-velocity gun in which everything has been sacrificed to weight of metal. The details of the heavy projectiles afford very instructive reading.

Coming now to the consideration of the ammunition (Pl. B) used by both the 1877 and 1879 patterns, we find as regards projectiles the three usual natures, shell, shrapnel, and case: these, however, differ in a number of details from those used in our Service, and are worth attention. Both shells and shrapnel have two copper rings on their exterior circumference in order to properly centre the projectile and prevent windage. The front ring is rounded in shape, but that in rear is cylindrical and has two cannelures filled with grease. In order to give the exact shape to the projectile the outer surface of the rings and the cylindrical portion of the shell or shrapnel are turned to the proper measurements.

The shells (Pl. B, Fig. 2) are 2·5 calibres long, and are of the kind so much in use abroad, but deliberately rejected by our Service, namely, annular segmental or ring shells as they are more commonly called—very effective projectiles against troops behind slight cover: those of the earlier pattern are similar to the Uchatius shells of the Austrian field artillery and to the German shells (pattern 1876). The light shell breaks up into about 140 fragments each of a mean weight of about 3½ ozs.

In 1880 a new light shell (Pl. B, Fig. 3) was designed by M. Babouchkine, the chief feature of these being the teeth of the different rings which were made so as to break joint and thus obviate the danger of the metal breaking

[1] 1 sagène = 7 feet.

up into strips along the lines of weakness and losing a great part of its effect: this shell breaks up into much more regular fragments. It is difficult to resist the impression that the Russians have acted wisely in giving their field artillery shell considerable man-killing properties. We, on the other hand, in our latest equipment appear to rely solely for this effect upon shrapnel, a projectile notoriously requiring for effective use a number of favouring conditions which one cannot always expect from the fickle goddess.

With shrapnel (Pl. B, Figs. 4 and 5) the bursting charge is placed at the base of the projectile: it is separated from the leaden bullets by an iron diaphragm and communicates with the fuze by the usual primitive central cast-iron tube filled with powder.

There are two types of shrapnel: the first (Fig. 4) is cast in a single piece, and the second (Fig. 4*a*) has two parts, namely, the body and the ogival head which fit into one another and are clinched by screws; it is the latter type that is of most importance, since it will probably be chiefly used in the future. There is, however, a third (Fig. 5), which has numerous advocates and is peculiar in its construction. It has a bronze head screwed on to the body of the projectile and is provided with an opening for the introduction of the bullets. After these are inserted, the opening is plugged by a leaden stopper; in this pattern the central tube is of wrought iron. The interior surface of the projectile has a number of spiral grooves, and it is alleged that fire effect is much more considerable with this projectile. In all patterns of shrapnel the bullets are of hardened lead, viz., four parts of lead to one of antimony, they are half an inch in diameter, and are coated with olive oil.

The case shot (Pl. B, Fig. 1) has an increased diameter at the base, which regulates the loading; the envelope is a sheet of tin, the ends being rivetted and soldered together; three sheets of zinc placed inside form a second envelope giving rigidity to the outer case. If this interior and uncontinuous envelope, so suitable for resisting pressure from outside without interfering with the break up of the case shot after leaving the muzzle, were abolished, the outer covering would have to be greatly strengthened, or the shot would break up in the gun. If, on the other hand, it received sufficient strength to resist this, the shot would not break up when required. Both envelope and base are of copper; the latter has a handle of leather to allow the case shot to be extracted if not required after loading. These case shot projectiles are filled with zinc bullets, without sulphur, sand, or molten resin.

Many interesting experiments have taken place with a view to determine the best construction for the envelope, the diameter for the bullets, and the proper rules for the conduct of case fire; these have been given by Colonel Chklarevitch in the "Russian Artillery Journal."

The question of fuzes has been no less difficult in Russia than elsewhere; indifferent skill in manufacture and in design, faults in the material, deterioration due to extremes of weather, careless handling, and other causes have contributed to make the selection of a good serviceable fuze a matter of much difficulty.

The frequent failure of the ancient types used in the last war is too well known to require remark. With the new material in 1877, a fair 10-sec. time fuze (Pl. C, Fig. 1) was brought out and satisfied the consciences of Russian gunners for some six or seven years. When the rearmament of the artillery was, however, completed, the inventive faculties of various ingenious Officers were called into use for the designing of a time and percussion fuze that should not only replace the 10-sec. fuze, but be in advance of the most perfect existing elsewhere.

After a great number of experiments with fuzes analogous to the Budin and Kreutz types, a fuze invented by Colonel Filimonov was selected for percussion use (Pl. C, Fig. 4), together with a base fuze (Pl. C, Fig. 3), due

to the same inventor and employed with the 9-inch mortar. At the same time the 10-sec. time fuze, to which had been added a 12-sec. fuze on exactly the same principle, was replaced by another 12-sec. fuze, while lastly a 16-sec. fuze was given to the siege artillery.

The 10-sec. time fuze, 1877 pattern (Pl. C, Fig. 1), is on the principle of the movable collar and circular powder channel. It will soon be out of date, and it is unnecessary to give a detailed description of its action. It may be said generally that, as usual in these fuzes, strokes and numbers, corresponding to the periods of combustion of the composition, are engraved plainly on the exterior circumference of the collar. In the 10-sec. fuze the figures show single seconds, the intermediate strokes allowing the fuze to be set at intervals of one-fifth of a second. All these fuzes are regulated at 0·4 of a second in the transport, so that in case shrapnel is suddenly required for close firing or to replace case, no preparation is needed. The chief faults of this fuze consist in the insufficient flame given by the cap composition, while the striker in many cases fails to sharply sever the suspending wire by which it is secured. The present 12-sec. time fuze, 1884 pattern (Pl. C, Fig. 2), differs mainly by the increased weight of the striker and the rounded form of the head, which prolongs the ogival-shaped head of the projectile, and is better adapted to overcome the resistance of the air. The general construction will be understood by reference to the Plate. The maximum time possible to allow for burst, namely, 12 seconds, corresponds to a range of 3,826 yards for the light gun, 3,608 yards for the horse artillery gun, and 3,498 yards for the heavy gun: beyond these ranges shrapnel cannot be employed by Russian guns, nor indeed could the effect be observed under ordinary conditions. The new fuze, it may be noticed, proved unsuitable to the new mountain gun; the shrapnel practice was most uncertain. A smaller 10-sec. fuze was therefore designed for it, allowing a maximum shrapnel range of 3,280 yards. As for the 16-sec. fuze for heavy ordnance, this only differs by its size and time of combustion. All the new fuzes are set at 0·3 sec. in peace; this corresponds to a burst at 109 yards in the case of 12- and 16-sec. fuzes and at 87 yards yards for the 10-sec. fuze.

The percussion fuze (Pl. C, Fig. 4), 1884 pattern, consists of a body, A, two screw-plugs, B B′, closing the fuze at top and bottom, the hammer C, needle D, safety pin E, cap piece F, and spring G soldered to the upper part of the cap piece, the lead washer, and safety pin I. The interior has three separate compartments, that in the centre being truncated and the others cylindrical; two notches in the head take the branches of the screw-key. The channel of the bottom screw-plug is closed by a tin washer (*a*). The needle grip *b*, is screwed into the hammer and supports the ends of the branches of the spring. The striker is of bronze. On firing the hammer drops into the central compartment, where the branches of the springs prevent it from flying forward. The cap containing the fulminate is screwed into the cap-holder, which is soldered to the end of the spring G. Before firing, the safety pin is pulled out. In peace the fuzes are not kept in the projectiles, but in special cases. The base fuze (Pl. C, Fig. 3) already mentioned consists of a body *a*, striker *b*, hammer *c*, a claw spring *g*, and cap *e*. The latter has four openings, *k*, through which the flash reaches the bursting charge.

The charges of all guns are made up with large-grained powders, a mechanical mixture in the same proportions as that in use in England, namely, 75 parts saltpetre, 15 charcoal, and 10 sulphur. The density of this powder is from 1·66 to 1·70, and the size of the grains varies from 0·25 inch to 0·39 inch.

The ballistic properties of this large-grained powder are defined by the results of trials with the light gun, the pressure being calculated by an

American apparatus known as the Rodman indicator, placed in position for this purpose in front of the breech-block. Under ordinary service conditions, the initial velocity, measured by a Boulengé chronograph, should be from 1,430 to 1,469 feet a second; the mean pressure should not exceed 1,700 atmospheres,[1] and no single one 1,950. These muzzle velocities are low according to our ideas, since the new 12-pounders give 1,700—2,000 feet initial velocity per second.

Up to a recent date the old 1866 friction tube has been in general use in the Russian artillery; with enlarged powder chambers and new charges and powders, it was found to give insufficient flame, and the one employed is a curved tube invented by Generals Mine and Platsov.

This instrument is in two parts, namely, the exterior tube and the friction arrangement. The tube is of copper: the friction arrangement is introduced, and the interval between the sides of the tube and the roughened thread inserted filled with mastic. Two small gutters prevent the upper part from expanding by the action of the gases, and the small tube of the friction arrangement from being driven forcibly back towards the gun detachment. The outer tube is filled with compressed powder, and closed by a washer of mastic (35 parts asphalt, 35 wax, and 30 turpentine).

The friction arrangement is made up of a small tube of bent brass, which contains the fulminating composition, the roughened ends, the paper washer, and the gutta-percha washer. The fulminating composition consists of 60 parts Berthollet salts, 10 parts sulphur, and 30 of antimony.

While on the subject of Russian fuzes, a most ingenious contrivance called the Berdan mechanical time-fuze may be noticed, in which the inventor has striven to utilize the rotatory movement of the projectile in order to secure an accurate burst, and thus obviate the well-known inconveniences which undoubtedly arise even with the best fuze compositions. A very slight inspection of this toy shows, however, that it is far too delicate and complicated an instrument for war purposes, the probability of the required precision being gained is slight, while the setting of the fuze takes long, and is dangerous in inexpert hands.

The definite adoption of heavy field-guns of a very superior stamp brought up the question of the desirability of change in the field equipment and material generally. It is a generally accepted fact, that the selection of a suitable equipment for any given new field-gun offers great difficulties, and takes more time than the choice of the gun itself. In Russia, where autocratic decisions have their value, the question was solved with a rapidity and success that afford a very instructive example. After careful and complete trials the gun-carriage, limber, and wagon proposed by General, then Colonel, Engelhardt, were definitely adopted in 1878, and the only important variation since that time has been the substitution, at a more recent date, of a lighter limber and wagon for the horse artillery gun. The general system adopted (Pl. D) includes a carriage entirely of steel and iron, wood being only employed in the wheels. In the Engelhardt system the most remarkable point is the extensive substitution of gutta-percha for cork, and the various elastic parts of the carriage. The cheeks of the gun-carriage are of ¼-inch boiler plate iron strengthened with angle iron, and their prolongation forms the trail; the cheeks are fastened to an iron axle, and to each other by three bolts placed at intervals along the trail and by the trail plate; in lieu of a trail eye there is a circular hole in the trail plate through which a strong pintle is passed. The trunnion beds and plates are of the usual form. The elevating arrangement is known as the double or Russian screw. This consists of an inner right-handed screw working in an outer

[1] 11 tons per square inch.

left-handed screw, the latter working in a gun-metal socket and acting on a lever, one end of which is fastened to a bolt connecting the cheeks, and the other supporting the breech of the gun. The trail (Fig. 4) is arranged so that by ploughing up the ground it may lessen the recoil, and is made particularly strong for this purpose. The elastic buffer (Figs. 2 and 3) is formed of two rectangular plates of gutta-percha, *a*, with a central hollow of the same shape. On the short sides there are two semi-circular lodgments for the passage of the bolts, *h*. Between the two plates there is a sheet-iron diaphragm with rivetted washers on each face, which fit exactly over the central hollow of the plates. The cap-squares have a similar washer; all this arrangement of washers and nuts is designed to retain the gutta-percha plates in position, and prevent their being displaced by the jolts and shocks they are always liable to. This employment of gutta-percha, a material hitherto regarded as one that stiffens in low temperatures and rapidly loses its elastic properties, is distinctly a point scored by Russian gunners. The secret of the Engelhardt system consists in the employment of a perfectly pure material, which is made to undergo a suitable preliminary vulcanization; a perfectly homogeneous and elastic gutta-percha is obtained in this way, and its properties are not affected even by a temperature ranging to 25° below zero. Gutta-percha washers are also placed at *m* (Fig. 2) to lessen the lateral shocks produced in movement.

Formerly cork springs supported the seats of the carriage; these have been replaced by gutta-percha springs made of a simple hollow cylinder, fitted at each end with a bronze collar and traversed by the nut *e*, which carries the sheet iron of the seat *d*, and passes freely in the collars and in the support *f*.

The framework of the limber is made up of two futchels which unite in rear, and of the fixed splinter-bar which forms the front. The connection is further insured by cross-pieces; all these are of strong angle iron. The union is strengthened by elbows, and in order to avoid bending the projecting portion of the splinter-bar, the latter is united to the futchels a little in advance of the front cross-pieces by short tensile stays (Fig. 8).

The rear ends of the futchels are united by two plates rivetted above and below into which the pintle is fixed. A similar axle serves for limber and ammunition wagons; this has two wings secured by a transversal rivet at right angles, and destined to unite the axle and the suspending springs. The gun-carriage rests therefore indirectly upon the axle, but by the agency of the springs placed below the latter. This disposition has the tendency to lessen shocks and movements which take place on the march, and to reduce the wear and tear which these causes so rapidly produce.

Without going into very elaborate details it may be noticed that the suspension of the carriage is so contrived that the weight of the frame, body, and load bear on the head of the springs, and are thence transmitted to the axle, so that all shocks and movements first place the elasticity of the springs in action, and all vibrations that might be dangerous are replaced by less violent vertical oscillations of the body of the carriage towards the axle.

The limber has a large single metal ammunition box secured to the cross-pieces and futchels by rivets so that it is not removable.

The ammunition box is of sheet iron, only $\frac{1}{16}$ of an inch thick; it has a low hand-rail in rear and at the sides. It is divided into two half-boxes (Pl. D, Figs. 5 and 7), and each of these, as shown by the sketches, into six cases, each holding one case of projectiles or cartridges.

The six lower cases are each intended for a case of projectiles, the upper shelves receive the cartridges, contained in leather cases, and provided with as many cylindrical frames as they are intended to hold cartridges. In front of this ammunition box is a second smaller wooden box attached

to the futchels by ratchets. The inclined upper surface of the latter, which also serves as footboard, opens and shuts with a swivel and hasp. It contains battery tools and spare pieces, that of the gun limber has in particular the sights, clinometer, quadrant, &c.

The pintle or iron post, 18 inches long, projects some 2 feet behind the axle of the limber. It is a very convenient method for limbering up, but it does not appear to present any other advantage over the more usual system. It causes a perpetual change of balance of the pole, the front end of which is sometimes up in the air and sometimes at the horses' knees. The limber ammunition box is placed somewhat in front of its axle, in order to counterbalance the pressure of the trail when attached; but since the amount of forage and ammunition carried is far from being invariable the adjustment of the weights is seldom satisfactory.

The leaders of the teams, instead of being directly harnessed to the traces of the wheelers, are attached to a sling splinter-bar at the end of the pole. To enable the wheelers to back the carriage the end of the pole has a large ring (Pl. E, Fig. 4) in which are two smaller rings each provided with a hook; from these to the collars there passes a strong chain. The swingletrees are of iron, the traces and couplings absurdly long, making a distance of 5 feet between the horses; this, combined with the frequent proximity of the pole to the ground, gives rise to the danger of entangling the horses' legs in the traces.

Turning now to the ammunition wagon, it will be evident from the sketch (Pl. E, Figs. 1, 2, 3, and 5) that in its essential parts it is similar in construction to the limber, the framework having two futchels joined by three cross-pieces, of which the central piece is a little in rear of the axle. This carriage can turn through an angle of 80°. The ammunition box is of similar construction to that already described, but it has a double interior capacity with a centre of gravity placed considerably in front of the axle; it is fixed at the sides by bent ratchets, and also by rivets to the framework of the carriage, on which it is supported by wooden brackets. The front and rear of this box have a single door opening downwards on hinges, and kept closed by three hasps. The projectile cases both for wagons and limbers are made of open work sheet iron, in order to facilitate loading and unloading, and preserve the projectiles in transport. Each case is in two half-cases, and the whole is strengthened by the arrangements shown in the sketch. (Pl. E, Fig. 6.)

The later pattern of horse artillery limber and ammunition wagon designed by General Engelhardt mainly aims at increased lightness of construction, in order to afford greater mobility to the guns acting with cavalry. The pintle is still adhered to, but its connection with the trail-eye has been altered and improved since it was found that with the other system the connection between gun and limber was occasionally severed when going fast over rough ground. In the new pattern there is an oblong ring at the end of the chain, which fits over the end of the pintle, made of the same form, and is then given a turn through half a circle.

A circular axle is joined to the branches of the framework by an arrangement of twin plates turning on a pivot: a combination of steel bolts, iron discs, and gutta-percha springs makes the whole less liable to damage by jolting, tie-pieces connect the centre of the axletree with the futchels of the frame and pass through small gutta-percha springs, held firmly between an iron disc and a disc of phosphorized bronze. A plate is rivetted both to the disc and to the branch of the frame; thanks to these arrangements lateral oscillations are very much reduced. The pole is similar to that in use by field batteries, but each horse artillery battery has six spare shafts each in two parts.

The ammunition box is in six compartments, the upper and lower compart-

ments being separated by a layer of sheet-iron. Each lower compartment has three case divisions, that at the top has three compartments in all. The floor of the box has a number of small holes to allow rain water to pass through in case it may have penetrated in spite of all precautions. One would think that powder would rapidly deteriorate by being exposed to the air in this fashion.

On the six gun limbers there are carried six sacks of oats and various spades, picks, and axes; each of the twelve ammunition wagon limbers has also to carry a sack of oats and a variety of battery tools; twelve iron bands to repair broken poles, as well as three spare pintles are distributed among the limber boxes of the battery.

The body of the new ammunition wagon has a similar system of springs; the projectile cases do not materially differ. The differences, generally speaking, are slight and unimportant.

Ammunition is carried by batteries in war as follows:—

		Shells.	Shrapnel.	Case.	Total.	Cartridges.	Friction tubes.
Horse artillery battery (6 guns).	Gun limber	7	10	3	20	23	25
	Wagon limber	12	10	3	25	25	70
	Wagon body	15	15	..	30	30	..
	Total per gun	61	60	9	130	133	165
	Total per battery	366	360	54	780	798	990
Light battery (8 guns).	Gun limber	13	15	2	30	30	38
	Wagon limber	13	15	2	30	30	102
	Wagon body Nos. 1 to 8	25	25	..	50	53	..
	Wagon body Nos. 9 to 12	25	25	..	50	50	..
	Total per gun	70	75	5	150	153	191
	Total per battery	560	600	40	1,200	1,224	1,528
Heavy battery (8 guns).	Gun limber	7	9	2	18	18	21
	Wagon limber	7	9	2	18	18	59
	Wagon body Nos. 1 to 8	12	15	..	27	30	..
	Wagon body Nos. 9 to 16	15	12	..	27	27	..
	Total per gun	48	54	6	108	111	139
	Total per battery	384	432	48	864	888	1,112

The fortress field batteries with 8 guns and 2 wagons have each a supply of 600 rounds a gun, but only one-twelfth of this is carried with the batteries in action, as follows:—

	Shells.	Shrapnel.	Case.	Total.
Gun or wagon limber	15	15	2	32
Wagon body	25	25	..	50
Total per gun	25	25	2	50
Total per battery	180	200	20	400

In the question of mountain material the Russian Army has long been in a transition state, but this period may now be considered at an end. In 1884 a steel mountain gun, called the 2·5-inch pattern, 1883, was adopted, and is replacing both the 3-pr. bronze guns which so long formed the armament of the service as well as the more recent 2·5-inch Baranovski guns.

The 2·5-inch Baranovski gun has a screw bolt breech mechanism, and the cartridge is contained in a tin case attached to the projectile; the later pattern has the more common cylindro-prismatic breech mechanism and the ordinary detached silk cartridge.

If it be considered for a moment that *mobilization produces 25 batteries of mountain artillery with 200 guns*, and further that Russia in Europe has no mountains, it becomes sufficiently obvious against what Power this very considerable deployment has been projected. If, as regards quality of field material, our new guns are certainly superior to the Russian, except in weight of metal, can the same thing be said for our mountain material? To answer this question it is only necessary to compare the tables given in the Appendix with the performances of our own guns.

There is one other point of importance: it has not been considered advisable or necessary to give Lieutenant-Colonel Scott's telescopic sights to our mountain artillery; but within the last year practically identical sights have been adopted for the Russian mountain guns, giving them a new advantage which it may perhaps be not too late to retrieve.

The new mountain gun (Pl. E[1], Figs. 1 and 2) is of steel, and has a long carriage giving great stability when in action: the carriage is heavy and is in two parts connected by a hinge-joint, and secured by bolts. The cheeks of the carriage consist of iron plates with edges bent outward, the trunnion plates are rivetted inside the cheeks of the carriage. When fired where there is no room for recoil, ropes are attached to the hook at *q* and the naves of the wheels.

The gun can be used on wheels or carried by pack transport. The ammunition case holds six cartridges and six projectiles; a horse carries two cases, each gun is supposed to have eight horses for ammunition or ninety-six projectiles per gun.

The projectiles (Pl. B, Figs. 7 and 8) used with the new gun can be very shortly described. The shell varies little in its characteristics from that in use by the field artillery. The shrapnel has a steel body A and a brass head F attached to the body by four screws. The bursting charge is in the base of the shell, and is covered by the steel cup B. The central tube is of iron and fits into the cup at one end and the plate G at the other, which is screwed into the fuze-hole. The bullets are of the same material as used by the rest of the service, namely, four parts lead to one of antimony; they are 100 in number for the shrapnel in question, and are retained against the walls of the projectile by an iron tube D. This projectile has two rings to centre the action and prevent windage; the whole weighs 8 lbs. 12 ozs.

This gun has a special carriage, and that used with the now discarded Baranovski gun is, it seems, to be employed with machine-guns.

As a rule the material of the foot mountain batteries is carried on the backs of horses, while that of horse mountain batteries is on wheels, the men of the battery all being mounted. For short marches and changes of position, however, the foot batteries keep their material on wheels.

This completes the account of the field material in the hands of Russian troops. Glancing back at the material as a whole, it is impossible not to be struck with the great progress made in this technical branch of the service since the last war, when it may be said that all was for the worst, in the worst of all possible artillery worlds. Admitting that the Russian artillery was much behind the age in 1877, that it was armed with bad guns, with a low

muzzle velocity, third rate man-killing projectiles, and fuzes whose action was chiefly conspicuous by its absence, it must in justice be allowed that quite another state of things now rules, and without any desire to over-estimate the value of science in unscientific hands, it must be conceded that this fact has much importance. It has been shown that the Russian artillery is now armed with a gun which, as regards practical fire effect in the field, is second to none but our own and the French, and superior to several foreign weapons, that the rearmament is complete, and that future wants can be met entirely in the home markets; that the arsenals and foundries bear favourable comparison with many of the best in Western Europe, and have enabled Russia to produce a peculiarly economical type of gun; that in every technical detail which has been examined progress is the rule; that inventions in all the paths of technical science are many, frequent, and valuable; that the difficult details of shrapnel, sights, and fuzes have been solved satisfactorily; that the equipments of batteries have been decided once and for all, in a manner to satisfy the requirements of the arm; that the manufacture of carriages for guns discloses a number of remarkable inventions and improvements, and that the supply of ammunition is calculated on a scale of wise liberality; that, in short, so far as a mere technical enquiry into material can carry one the Russian artillery is a formidable arm. On the other hand, in certain details there are defects, but of not sufficient importance to counterbalance the good points noticed. Of these defects the clumsy coupling of the teams has been already mentioned, together with the insecurity of the pintle attachment in the 1877 carriages, and the want of care displayed in the proper adjustment of weights. One or two minor points remain to be noticed. It has been observed that the sheet iron of the ammunition boxes is only $\frac{1}{16}$ of an inch in thickness, and that the cartridges are all carried in the upper part of the ammunition boxes; it would appear, therefore, that since the brown powder invented in Germany, with its peculiar properties of not exploding by the force of a blow, has not been adopted,[1] and that the ordinary large-grained black powders are in use, that these limbers and ammunition boxes may be exploded if struck by an infantry bullet, a point of the very greatest importance. Nor will it have escaped the attention of artillerymen that Russia has not succeeded in inventing a base fuze except for mortar fire, and further that the majority of the shrapnel employed have the same absurd central tube, taking up much valuable space, as that from whence we are slowly emancipating our service. Lastly, no good combined time and percussion fuze has been introduced; in all other artilleries such a fuze is now considered indispensable.

Turning now to the heavier natures of ordnance, the various types may be most conveniently considered under the separate headings of siege, fortress, and coast material, although certain calibres are indiscriminately used for one service or the other.

All questions relating to the heavier natures of guns have been studied profoundly in Russia since the Crimean War, when Russia saw her coasts insulted by the "amphibious strength" of a powerful fleet. In 1858 Colonel Gadolin analyzed and determined the conditions of resistance of the bores of guns, and by 1861 he was able to demonstrate the possibility of increasing the resistance to explosions by more methodical manufacture of heavy ordnance. While Gadolin's theory served as the basis for the construction of the famous Krupp guns, it is equally true that the formulæ made use of in Gadolin's two mémoires published by the Russian Artil-

[1] The Okhta powder mills claim that they have discovered the secret of this powder, and are now manufacturing large quantities of it.

lery Journal in 1863, were originally due to MM. Lamé and Clapeyron, and had been published so far back as 1833. Russian industry was not in any position to make use of Gadolin's new application of old discoveries, and the first experiment took place at Essen. Russia, nevertheless, contributed largely towards the creation of the hooped steel system, which subsequently became the recognized method of construction for heavy ordnance.

The siege guns are intended to form part of the siege parks and to be used on the offensive : the fortress guns are, as their name implies, intended for the defence of strong places in Continental Russia ; the third and most powerful type is destined to oppose the equally or perhaps still more powerful batteries of an ironclad fleet. In the following description of Russian heavy ordnance, only a few points of importance will be touched on in the text, so that the general character of the heavy artillery may not be lost sight of under a mass of details. All these details, ranges, penetration into earth and iron, weights, &c., are fully set out in the Appendix for all the most important types of guns, in order to make the whole account as complete as possible.

The SIEGE ARTILLERY includes the following guns :—

(1.) 4·2-*inch R.B.L. guns* (Pl. F, Fig. 1), for dismounting the enemy's guns, and for fire effect generally at medium ranges. This gun has a steel tube and steel hoops ; the breech mechanism is on the cylindro-prismatic wedge principle ; there are two cylindrical chambers, one for the cartridge the other for the projectile, connected by a neck where the rifling begins ; a second shorter neck joins the projectile chamber with the bore proper.

(2.) 6-*inch light steel R.B.L. gun of* 120 *puds*, for every description of fire at middle and long distances against troops and moderately strong obstacles, firing shells, shrapnel, and case. The gun is entirely of steel, with cylindro-prismatic wedge ; it is one of the latest additions to the siege train.

(3.) 6-*inch long steel R.B.L. gun of* 190 *puds* (Fig. 2, Pl. F), for distant bombardment. This weapon has an inner steel tube and steel hoops enveloping the breech from the front extremity of the wedge ; one of these hoops carries the trunnions. The breech mechanism is the same as in the last gun, and the arrangement of the chamber very similar to that of the 4·2-inch gun.

(4.) 8-*inch screw steel R.B.L. gun* (Fig. 3, Pl. F)—a peculiarity of the Russian siege artillery—for firing against earthworks with shells containing a large bursting charge. This gun has also two essential parts, the inner tube and the body of the gun proper. The tube is a solidly cast single piece, and forms both the chamber and the rifled portion of the bore. The body of the gun is also in two parts, namely, the breech and the chase. The latter, for a portion of its length, has a series of cylindrical hoops in steps ; these hoops are continued over the breech, while round the portion which corresponds to the rear end of the cartridge chamber is a thicker hoop forming a salient. The breech has a cylindro-prismatic wedge, and the rifling is increasing. In putting this gun together after a journey, the breech is first placed on the carriage and the chase then raised to the same level, fitted to the breech, and then attached by a turning movement being given to the connecting screw. Into the body of the gun so put together, the inner tube is inserted, and the whole carefully connected by an arrangement of clamping screws ; it takes twenty men three hours to put this gun together, and great results are expected from its portability and power. It was used at Rustchuk in 1877, and gave every satisfaction.

(5.) 3·4-*inch R.R.L. steel howitzer*, for vertical fire against troops at short distances.

(6.) 8-*inch steel R.B.L. howitzer* (Fig. 4, Pl. F), for vertical fire against casemates at medium ranges. This mortar has a row of hoops like the

8-inch gun, and the chamber is on the same principle as the 4·2-inch gun; the rifling is increasing.

(7.) 9-*inch screw R.B.L. howitzer* (Fig. 5, Pl. F), for vertical fire against casemates when a very heavy projectile and destructive effect is required. This weapon is built upon the same principle as the 8-inch screw gun; it is a very cumbrous piece of ordnance, and in travelling the breech cannot be transported on the carriage, as in the case of the 8-inch screw gun, for the breech itself weighs over 3 tons, and the carriage 2½ tons. The breech is, therefore, transported on a special carriage; the putting together of this gun is managed on the same principle as the 8-inch screw gun.

As a rule, it may be said that during the process of rearmament which, as regards heavy ordnance, is never ending, the principle is in Russia to give the newest and best guns to the siege parks and coast batteries, and to scatter the more ancient weapons among the Continental fortresses, the most indifferent types being given to the least important places.

FORTRESS GUNS include six different types; each of these has again a certain number of varieties.

(*a.*) *Bronze* 4- *and* 9-*pr. R.B.L. field guns*, formerly in the hands of the field troops, for use against hostile troops in the open.

(*b.*) 4·2-*inch R.B.L. guns* (Fig. 1, Pl. F), for dismounting the enemy's guns at short and middle distances. These have been already described.

(*c.*) 12- *and* 24-*pr. long and short R.B.L. guns* in bronze and cast iron. A great variety of these guns exist.

(1.) 12-pr. cast-iron double wedge R.B.L. gun. There are two patterns of this gun, which differ only in their exterior shape. The first has a cylindrical breech; to right and left are two lateral cylindrical appendages with a common axis which meets and is perpendicular to the axis of the piece. These two appendages form the lodgment of the double wedge; they are terminated by planes perpendicular to the axis of the trunnions; the shoulders of the trunnions are cylindrical. The second pattern has a breech with the form of a parallelipiped with squared edges; it has the same lateral appendages as the pattern just described. The breech finishes off with a large cylindrical ring concentric with the bore of the piece; the shoulders of the trunnions are square. The breech end and chase are similar in each pattern; these form two truncated cones with their major bases towards the rear.

(2.) 12-pr. cast-iron R.B.L. gun. The breech mechanism has a cylindro-prismatic wedge. The chase and breech take the form of truncated cones; the chase ends in a cylindrical rim. The breech is a cylinder, cut on the left side by a plane face perpendicular to the axis of the trunnions; it is terminated by a rim, also cylindrical, on the upper portion of which is cut a slight groove or recess, on which the clinometer is placed. The trunnions and their shoulders are cylindrical.

(3.) 12-pr. cast-iron R.B.L. gun, with cylindro-prismatic wedge. This weapon has a truncated chase and breech end; the chase finishes with a cylindrical rim. The breech is a cylinder, cut on the left side by a plane face perpendicular to the axis of the trunnions; it finishes off with a cylindrical rim, on the upper part of which a groove is cut to receive the clinometer. The trunnions and their shoulders are cylindrical; the interior shape is the same as the 12-pr. double wedge guns.

(4.) There are a few 12-pr. steel R.B.L. guns with cylindro-prismatic wedge like the German guns of the 1873 pattern, but the manufacture is discontinued.

(5.) Long cast-iron 24-pr. R.B.L. guns, 1867 pattern, with double wedge. These are of the same shape and make as the corresponding 12-prs.

(6.) The long cast-iron 24-pr. R.B.L. gun (Fig. 1, Pl. G (Vol. Pl. 5)), with cylindro-prismatic wedge, is similar to the corresponding 12-pr.; and the

(7.) 24-pr. long bronze R.B.L. gun, pattern 1867, is also built exactly on the same line as the corresponding 12-pr.

(8.) The 24-pr. short cast-iron R.B.L. gun, pattern 1871 (Fig. 2, Pl. G), was designed to emulate the performances of the German 15 c. gun which took so important a part in breaching the Strasburg lunettes; it is on the same principle as this gun throughout.

(9.) The 24-pr. short cast-iron R.B L. gun, pattern 1872, is of bronze, and resembles in its general forms the 1867 long 24-pr. gun. Both these short 24-prs. are intended more particularly for enfilade fire, and dismounting the enemy's guns.

(10 and 11.) Only a small number of long and short 24-pr. steel guns (Fig. 3, Pl. G) exist. The first type is a great improvement on No. 7; it is 10 feet 8½ inches long, and has an initial velocity of 1,053 feet a second.

(*d.*) *The 6-inch light and heavy R.B.L. guns*, for direct fire at long distances, have been already noticed. One of the varieties of this gun, namely, the 6-inch or long 24-pr. R.B.L. gun with steel hoops, is particularly reserved for the fortress armament. This gun has a steel tube with a row of steel hoops shrunk over it, reaching from the front end of the breech-closing wedge. The breech mechanism is cylindro-prismatic. There are two chambers, one for the cartridge and one for the projectile, connected by the usual truncated necks; the twist of the rifling is uniform. This gun fires a lead-coated projectile; it has 24 grooves, weighs over 3 tons, and has the high initial velocity of 1,560 feet a second.

(*e.*) *Light 8-inch steel R.B.L. guns*, for direct fire against obstacles at long ranges.

(1.) Of these, the 8-inch light steel R.B.L. gun of the old pattern has a steel tube and three hoops (Fig. 4, Pl. G), one of which carries the trunnions. Cylindro-prismatic wedge; weight 5 tons; initial velocity 1,050 feet a second.

(2.) The 1877 pattern light 8-inch steel R.B.L. gun, weighs about 5¾ tons, has forty-six grooves with an increasing twist in the rifling. The initial velocity is 1,312 feet a second.

(*f.*) *6-inch and 8-inch bronze, cast-iron, and steel howitzers*, for vertical fire against blindages and troops at medium and long ranges.

(1.) 6-inch bronze R.B.L. howitzer. This weapon has a breech of cylindrical form, cut by four planes parallel to the axis of the bore. The lower plane has a swallow-tailed shaped slot, into which gears the end of a toothed elevating arc. The chase is truncated; the trunnions strengthened by square shoulders; the axis of this meets that of the howitzer, whose centre of gravity is at the intersection of these two axes. The breech has the cylindro-prismatic mechanism, and the wedge is of steel. Two screw hooks, fixed on the edge of the breech, receive the shell carrier. The chamber is concentric with the bore; the vent channel is perpendicular to the axis of the piece, and the vent itself is placed in position by the side. The twist of the grooves is uniform. This gun has twenty-four grooves, and weighs 31 cwt.

(2.) The 8-inch bronze R.B.L. howitzer differs very little in construction from the above. It has a prismatic wedge and Broadwell ring.

(3.) The 8-inch steel R.B.L. howitzer, 1870 pattern, has a single row of hoops, the cylindro-prismatic wedge, and uniform twist in the rifling. It has thirty grooves, and weighs nearly 4 tons.

(4.) The 8-inch cast-iron R.B.L. howitzer, pattern 1873, is built on the same general lines, with a few modifications due to change in the material.

(5.) The 8-inch steel R.B.L. howitzer (Fig. 4, Pl. F), pattern 1877, has been already described.

This completes the list of the weapons in use by the fortress artillery, and

in the Continental strongholds of Russia. It only remains to briefly enumerate the larger types of guns in use in the sea batteries.

COAST GUNS include the following ordnance (Pl. H) :—

(1.) 6·03-*inch steel R.B.L. guns.*—These have a similar external appearance to the 4- and 9-pr. guns ; they are, in fact, the old 24-pr. steel muzzle-loaders converted. They have twenty-four grooves, and weigh nearly 4 tons.

(2.) 8-*inch cast-iron and steel R.B.L. guns.*—Four varieties of these exist :—

(*a.*) 8-inch steel R.B.L. gun without hoops, with a similar appearance to the 4- and 9-pr. guns (Pl. H, Fig. 7) ; it has a vent perpendicular to the axis of the piece, and a prismatic wedge.

It may be conveniently noticed here that when the principle of breech-loading was adopted in Russia, only a small number of 8-inch muzzle-loaders were completed ; others were in course of preparation, some being turned and bored but not rifled ; others only turned on their outer surfaces, and not bored to any definite calibre ; others, again, were in the rough stage.

The guns already rifled were increased to a larger calibre, transformed into breech-loaders, and rifled afresh ; these form the category of 8·5-inch guns which will be mentioned below. The other incomplete 8-inch guns were also transformed into three different types of steel non-hooped guns. The first of these consists of those muzzle-loaders which had been completed, but had not been rifled ; the second of the material which had been partially prepared for muzzle-loading ; and the third of ingots in their rough stage. The three are distinguished by their length, which increases from the first to the third type ; the breech has also a different shape in each type.

In the two first patterns the cylindrical breech finishes off with a rounded edge, and is cut on its left side with a plane perpendicular to the axis of the trunnions ; in the third pattern, the breech is thicker, and has these flat surfaces on each side. The latter has 30 grooves, weighs 8 tons, and has an initial velocity of 1,254 feet a second.

(*b.*) The 8-inch steel-hooped R.B.L. gun (Fig. 6, Pl. H) has an inner steel tube, and is strengthened by hoops extending from the fore end of the lodgment of the breech block to the beginning of the chase. One of these hoops carries the trunnions ; it is wedged in its fore part by a ring in two pieces, which is bedded in a circular groove cut on the exterior surface of the steel tube, in order to guard against the hoops slipping to the front ; the end hoop, placed over the point where the series of hoops begins near the breech, bears against a projection from the tube, and similarly prevents all chance of shifting from front to rear. The breech has the prismatic wedge, through which the vent is pierced axially. The chamber is eccentric, the grooves have a uniform twist. This gun weighs over 9 tons, has 30 grooves, and an initial velocity of 1,315 feet a second.

(*c.*) The 8-inch cast-iron R.B.L. hooped gun (Fig. 1, Pl. H) has a cast-iron inner tube and a steel jacket ; very few of these exist.

(*d.*) The 8-inch steel-hooped R.B.L. gun (Pl. H, Fig. 2) with screw breech-closing mechanism. This gun has a steel tube and hoops of the same material. The peculiarities of construction appear on reference to the Plate. The last hoop but one has a series of grooves on its lower surface, into which fit annular excrescences which project from the outer circumference of the inner tube. Applied when at white heat like the rest, this hoop, on contracting when cold grips the tube firmly, and exercises a secure longitudinal and transversal pressure. The breech-closing arrangement is the screw of the French Navy. A good many of these guns exist, but their manufacture has been now discontinued.

(3.) *The* 8·5-*inch steel R.B.L. guns* have been already mentioned.

(4.) 9-*inch cast-iron and steel R.B.L. guns.* Three varieties of these exist :—

(*a.*) The 9-inch steel hooped R.B.L. gun of the old pattern (Pl. H, Fig. 8)

has an inner steel tube ; the breech and the breech-end are united by four successive steps of metal, the two last hoops of the first row resting against the steps ; the hooping is in two portions, the first having a single row of three hoops, the second including two rows of hoops. One of the outer hoops carries the trunnions ; it is kept in place by a ring which fits into the first row of hoops as in the 8-inch guns ; the two last hoops of the second row project from the rest of the hooping and the breech end. The breech has the prismatic wedge ; the chamber is eccentric and the vent axial. This gun weighs nearly 15 tons, has 32 grooves, and an initial velocity of 1,315 feet a second.

(*b.*) The 9-inch steel screw R.B.L. gun (Pl. H, Fig. 3). This gun has a peculiar arrangement of the hoops which will be best understood by reference to the Plate ; the breech mechanism is on the French screw principle with an axial vent. The hand-wheel of the breech screw has at its upper extremity an iron lever whose point may be successively fitted into the notches of the upper portion of the circumference of the hoop over the breech end. This gun has two sights resting on two bronze supports fixed right and left of the breech. The gun weigh 16 tons, has 32 grooves, and an initial velocity of 1,315 feet a second. No guns of this kind have been made since 1877.

(*c.*) The 9-inch coast R.B.L. gun, pattern 1877, differs from (4) (*a*) by its different trace and dimensions ; the exterior is very similar. In this weapon, as in all guns constructed at this particular period in Russia, there are the two chambers for cartridge and projectile ; the vent is pierced axially ; there are 52 grooves, the gun weighs 15 tons, and has an initial velocity of 1,360 feet a second.

(5.) 11-*inch steel R.B.L. guns* :—

(*a.*) 1877 pattern (Pl. H, Fig. 9), does not differ from the type proper to this period. Weight 27 tons ; initial velocity 1,476 feet a second.

(*b.*) The more modern type of the gun, constructed at the Obukhov foundry, is hooped right up to the muzzle, the hoops toward the fore end of the chase being shrunk over graduated steps made for this purpose in the outer surface of the inner tube.

(*c.*) The 11-inch long steel R.B.L. gun (Fig. 4, Pl. H) weighs 43 tons. It may be remarked that Russia has been unable so far to produce good ammunition for her 11-inch guns, and is tributary to Krupp in this single instance.

(6.) 14-*inch short steel R.B.L. gun*, pattern 1877, only differs from the 11-inch, 1877 pattern, in dimensions ; it weighs nearly 58 tons, and has 80 grooves.

(7.) 9-*inch and* 11-*inch coast R.B.L. howitzers*. Of these there are seven different types, as follows :—

(*a.*) 9-inch steel R.B.L. howitzer, with cylindro-prismatic wedge. This has a steel tube and a row of hoops ; two half-rings make a support against which the first hoop rests ; the twist of the rifling is uniform.

(*b.*) 9-inch steel screw R.B.L. howitzer, and (*c*) 9-inch cast-iron R.B.L. howitzer do not differ materially in dimensions from (7) (*a*).

(*d.*) The 9-inch R.B.L. howitzer, 1877 pattern (Pl. H, Fig. 5), varies only in its interior trace : its weight is nearly 9 tons ; it has 52 grooves.

(*e.*) The 9-inch screw R.B.L. howitzer has been mentioned among the siege guns.

(*f.*) The 11-inch steel R.B.L. howitzer, with cylindro-prismatic wedge, only varies in a few measurements from the old pattern 9-inch steel mortar.

(*g.*) The 11-inch cast-iron howitzer has a cast-iron tube with a single row of ten steel hoops up to the muzzle.

The carriages in use by the siege and fortress artillery are for the most

part of metal and are distinguished by their great variety of pattern. As a general rule it may be said that almost every gun and mortar has its own special and particular carriage. Distinguishing them by names, there are the Semenov carriages for 8-inch and 9-inch coast guns ; the Gorlov, Chvede, and Chantz carriages also for the 8-inch guns ; the "Artillery Committee" and Andriev carriages for 60-prs. and 3- and 6-inch guns. Among the wooden carriages there are the Venglovski and Nasvietevitch, while of the large types the majority are known by the calibre of the guns they are intended for. In the following description of the carriages of heavy ordnance details of construction have been omitted or relegated to the Appendix. It has been attempted to give a sketch and short account of the more important types so that the work may be of practical use if the need arises. The following types are those in most general use :—

(1.) Iron field carriages for 4- and 9-pr. guns.

(2.) Garrison carriages, 1865 pattern, for R.B.L. 24-pr. cast-iron, steel, and bronze guns ; for 12-pr. R.B.L. cast-iron guns and S.B. cast-iron 24-prs. Many of these were modified in 1874 and succeeding years in order to enable a limber to be added so as to transport the 24-prs. from point to point, a process not practicable at the date given, owing to the diminutive size of the wheels. The weight of this type is about 22 cwt., and the height of the axis of the trunnions 4 feet 1 inch.

(3.) Siege carriages, 1869 pattern (Pl. I[1], Fig. 1), for rifled bronze 24-prs. and middle weight cast-iron guns. In these the elevating arrangement is a simple bronze screw ; it is of somewhat complicated construction, but can be used for travelling. Its weight is just under a ton with the wheels, and the height of the axis of the trunnions 4 feet 10 inches.

(4.) Siege carriages, 1877 pattern (Fig. 1, Pl. I), for 24-pr. bronze guns and cast-iron middle weight guns, 4·2 inches and 6-inch light and steel R.B.L. guns. Owing to the importance of the latter guns this carriage is one of the best employed in the service. The weight of the gun on this carriage is thrown towards the rear so as to lessen the jar to the wheels, to increase the pressure on the trail, and to diminish the recoil. For short distances the gun can be carried in its firing trunnions ; in its proper travelling position it rests on an iron cushion as shown by the dotted line in the Plate. The sighting arrangements in both these carriages are similar to the German *richtscala*. The height of the axis of the trunnions is 5 feet 11 inches, and the weight of the carriage 22 cwt. with the wheels. A maximum elevation of 26° can be given and a maximum depression of 8°.

(5.) Siege carriages, 1878 pattern (Fig. 2, Pl. I), for 24-pr. R.B.L. hooped guns. These can also take the 6-inch guns of 190 puds, and all 12- and 24-prs., except the short bronze 24-prs. of the 1873 pattern. This carriage is very similar to that last described but is generally stronger ; it allows the gun to fire over a 5 feet 11 inch parapet, and the total weight is 32 cwt. ; an elevation of 40° and a depression of 8° can be given.

(6.) Howitzer carriages for the 6-inch R.B.L. pieces (Figs. 3 and 4, Pl. I). These have a toothed elevating arc, fixed to the breech and fore part of the weapon, which steadies the piece when laid. Carriage, howitzer, and limber weigh 4 tons ; elevation to 75° and depression to 5° can be given.

(7.) Carriages for 8-inch rifled and 8-inch light howitzers (Figs. 1 and 2, Pl. K) ; these latter were originally intended for the 8-inch guns also, but the low parapet needed was found unsuitable ; the 8-inch guns have now the 9-inch howitzer carriage. The weight of this carriage is over 2 tons.

(8.) The 3·4-inch R.B.L. howitzer carriages are distinguished by an improved side elevating arrangement enabling an angle of 65° elevation and 10° depression to be given.

The question of carriages for the heavy guns in use by the coast batteries is

a matter which concerns more particularly a Naval Intelligence Department; the same remark applies to the heavy armour-piercing projectiles, casemates, and platforms. Only a very summary description of these will therefore be given, certain diagrams being added to enable the heaviest and most modern types of guns to be at once identified in case of necessity. There are ten distinct natures of carriages for heavy ordnance in use by the Russian coast artillery.

1. The Artillery Committee carriage, now replaced by a later type.

2. The Andriev carriage, more particularly used in casemates for the old 60-pr. guns. Maximum elevation 36°, and depression 6°.

3. The 8-inch gun coast carriage (Pl. I[1], Fig. 2), Gorlov pattern; weight over 2 tons; height of the axis of the trunnions 4 feet 6 inches; maximum elevation 26°, and depression 9°.

4. Colonel Chvede's carriage (Pl. I[1], Fig. 3), for 8-inch guns firing through embrasures. Weight over 3 tons; height of axis of the trunnions 4 feet 8 inches; maximum elevation 10°, depression 5°.

5. Admiral Chantz's carriage (Pl. I[1], Fig. 4), designed originally for the old 60-prs., and now often employed for 8-inch R.B.L. guns. Weight over 2 tons; height of the axis of the trunnions 4 feet 3 inches. Maximum elevation 16°, depression 6°.

6. Semenov's carriages (Pl. I[1], Fig. 5) for 8-inch and 9-inch R.B.L. guns. Employed either in open or casemated batteries. Weight over 2 tons for the 9-inch guns; height of axis of trunnions 4 feet 6 inches. Maximum elevation 23°, and depression 7°; for the 8-inch gun the weight is less and the angles of fire 25° and 8° respectively.

7. 9-inch howitzer coast carriage (Pl. L, Fig. 1) closely resembles the 9-inch gun coast carriage, but is stronger in make and has a different sighting arrangement; this carriage has a shell-lifting machine.

8. 11-inch gun coast carriage (Pl. L, Fig. 2). This is an important addition, giving a horizontal field of fire of 90°; its weight is over 3½ tons, maximum elevation 14° 30′, depression 6°, and length of recoil 4 feet 8 inches to 5 feet.

9. 11-inch and 14-inch coast carriages (Pl. L, Fig. 3) with hydraulic brakes. These are of the 1877 pattern, and differ from the last by using glycerine in the cylinders. The total weight of carriage proper with traversing carriage, &c., exceeds 34 tons.

10. Turret carriage for 11-inch guns; giving all-round fire; a maximum elevation of 15°, and a depression of 3°. Seven men are required to work this gun, working three different handles.

Of the projectiles in use by siege, fortress, and coast artillery, there are none that offer any very striking characteristics or novelty of design. The penetration into iron plates being given in the general tables of the Appendix for the most important guns, no further details will be added. It may be noticed that all these projectiles may be divided broadly into two classes, namely, lead-coated projectiles, fired from guns designed before 1877, and secondly, projectiles with copper rotating rings, fired from later types of ordnance.

Von Schneher[1] states that the complete armament of the whole of the Russian land and sea fortresses requires 7,422 guns and 2,230,000 projectiles.

IV. Artillery Establishments.

The artillery establishments of the Russian Government belong to three distinct categories: first, those concerned with the production and care of

[1] *Die Land und Seemacht Russlands.*

warlike stores, or of the service of material generally; secondly, the instructional establishments; and thirdly, the remount service. The various branches of this service can be conveniently considered under these three general headings.

A.—*Service of Material.*

Generally speaking, these establishments may be divided into two classes: one concerned with the production of guns, powder, &c., and the other with preservation and storage. In both of these classes repairs are executed, but the productive establishments make it the rule only to undertake larger jobs where a complicated machinery is needed.

The productive establishments include—

(1.) Three small-arm factories at Tula, Sestrorietsk, and Ijev, which turn out rifles complete with all accessories.

(2.) One cartridge factory at St. Petersburg, as well as a private firm (Gillenschmidt's) at Tula employed by the State.

(3.) Three powder mills at Okhta, Mikhailovsk-Shostka, and Kazan, supplying both Army and Navy.

(4.) Three local arsenals at St. Petersburg, Briansk, and Kiev, with foundries attached to the two first; guns are here constructed, and all other kinds of artillery material for land service are both constructed and repaired.

(5.) A rocket manufactory at Nikolaiev.

(6.) Two circle artillery workshops at Tiflis and Warsaw for the repair of material with the troops.

Various other establishments exist, such as the Zlatoust sword factory, but do not come under the artillery authorities.

In principle each establishment includes a certain number of sections, subdivided into workshops, magazines, depôts, hospitals, and sick-wards. When the establishment is situated in an open town, a local artillery detachment is charged with the maintenance of order and the escort of convoys. In the general routine of duty, three departments are distinguished, namely, the command, whose action extends over the whole service, and in particular over the personnel: secondly, the technical department, embracing the execution of works, testing objects constructed, care of machinery, &c.; and thirdly, the administrative department, whose duties entail the preparation and distribution of provisions, and the care of material other than that under the technical department. This administration is directed by a council or commission, with a cabinet or committee for its executive organ.

All productive works, with the exception of the Tiflis and Warsaw workshops and the rocket factory, are under the general direction of artillery for all matters connected with technical service, and are immediately supervised by inspectors. With regard to interior service generally, discipline, command of attached local artillery, and dealings with the intendance, they come under the authority of the District artillery commandants. There are three inspections over the local arsenals, powder mills, factories, &c., and a fourth has recently been created for supervising the material of State and private metallurgical industries. These inspections number from three to six offices, with officials, secretaries, &c. The greater part of the works are executed by civil and foreign mechanics, except at the Warsaw and Tiflis workshops, where only soldiers are employed, but the general direction and superintendence is everywhere given by Officers and agents of the artillery.

The method by which warlike stores are passed into the service is as follows:—In each small-arm factory the weapons when completed are handed over to be tested by a special commission, immediately under the orders of the General Direction, and composed partly of artillery Officers chosen by the Grand Master, and partly of Officers of infantry and cavalry

nominated by the chief of the Military District, within the limits of whose command the factory is situated. The president of this committee and the other Officers selected from the artillery retain their posts for three years, the other members for not less than one year; the assistant-director of the technical department of the factory becomes *ex officio* a consultative member of the body. Establishments other than those under Government are permitted, on payment, to have their produce tested in these State factories.

As regards personnel, Tula has 12 Officers and 29 officials, with a local artillery detachment of 4 Officers and 200 men; the other two small-arm factories are on the same scale. The annual output from these small-arm factories averages 65,000 complete rifles (Berdan No. 2), besides dragoon and Cossack rifles and rifle-barrels. At a pinch, however, this can be greatly exceeded; thus in 1878, according to statistics published by the War Ministry, 480,455 arms were made, namely, 447,000 infantry rifles, and 33,455 Cossack rifles, in addition to 100,000 rifle barrels. Briefly stated, then, it may be said that Russia possesses the machinery for turning out unaided nearly half a million of rifles yearly, and this power is not without its importance.

At the cartridge factories mentioned all small-arm ammunition is prepared, only the powder coming from the mills given in (3). The receiving committee is on the same lines as in the case of the small-arm factories. The St. Petersburg factory is divided into six sections, which are subdivided into twenty workshops; a superior Officer directs each section, and a subaltern Officer each workshop. In the 1st and 2nd sections the manufacture of cartridge cases is carried on; in the 3rd that of the caps; in the 4th the bullets are cast and the cases filled; in the 5th all instruments and machines needed by the other sections are made; in the 6th percussion- and time-fuzes are manufactured. A Major-General is in charge of this factory, and the personnel includes 48 Officers, 15 artillery agents, besides non-commissioned officers, &c. In conjunction with Gilfenschmidt's firm at Tula, about 100,000,000 cartridges are annually made, the latter factory turning out one-third of the whole; this does not, however, represent the full power available in case of need, for in 1878 the Government factory alone turned out 123,000,000 rounds.

The powder mills undertake the entire charge of everything relating to the manufacture and care of explosives, including the various chemical compounds required by certain services. Manufacture is always suspended during the winter, and the mills are only at work from April to September. Receiving committees exist here also. The personnel includes 11 to 15 Officers, 13 to 19 officials, 2 draughtsmen, and a local artillery detachment of 300 to 400 men at each powder mill.

The Ochta mills, which date from the year 1715, were considerably enlarged between the years 1868 and 1877; they are now capable of producing at need 2,455 tons a year. The steam machinery has 369 horse-power, and the hydraulic machinery 921 horse-power; 725 workmen are employed. This mill is divided into five sections: in the three first the preparation and mechanical mixture of primary materials take place; in the fourth this is made up in readiness for use; the fifth section contains the Officers' and workmen's houses. A sixth section for explosive materials of the nitro-glycerine class is in course of formation. So far as can be learnt there is at present no chance of a surprise in this quarter from Russia. It is true that articles have been written with wonderful tales of the devastation wrought by a compound called *tsilotcor*, literally "force-producer," or *silatvor*, as it has been more generally written in England. This compound is the invention of W. von Ruckteschell. It is very far from being the revolution-producing compound it is generally described. In reality it is nothing newer than nitro-

cellulose, the trinitro-product of wood fibre. General Feodorov having made a number of experiments at Ochta found the invention was of no value for practical purposes.

The average annual output of powder is now about 2,740 tons, but this can be doubled if required.

The local arsenals make the greater part of the bronze and cast-iron guns, and since 1883 have made the new steel field-guns as well. They also manufacture projectiles, gun-carriages, and ammunition wagons, and execute all repairs beyond the power of the district workshops.

The St. Petersburg and Briansk arsenals each include a gun foundry and workshop for the manufacture of the new breech mechanism. That at St. Petersburg is on a far larger scale than the one at Briansk, and numbers in its personnel 18 Officers, 23 officials, and 164 men. Judging by the average output at these establishments, and comparing them with the year 1878, it appears justifiable to conclude that some 300 field-guns and limbers could be turned out all complete within the year in case of need.

The Nikolaiev factory makes both signal and war rockets; only a small personnel is maintained. There exist no rocket batteries proper in Russia, but war rockets have been frequently used in Asia and the Caucasus, the batteries being provisionally furnished with the necessary material. An artillery detachment at the Nikolaiev factory serves to execute experiments, transport the manufactured articles, and instruct troops in their use. In 1878, 3,000 2-inch war rockets, 1,550 3-inch signal rockets, besides incendiary and life-saving rockets, were manufactured.

Lastly, the two circle artillery workshops are intended for both repair and construction of material and small-arms. The necessity for having a workshop of this kind in the centre of the Polish fortified region, and another in the Trans-Caucasus, very early forced itself upon the attention of the authorities, who have always aimed, not only at making Russia self-containing in herself, but also at enabling the defenders of these two frontier and outlying territories in particular to maintain themselves in case of temporary isolation: the personnel of artificers, &c., at each point numbers about 100.

This closes the list of the productive establishments. Of those concerned with the care and storage of material the Military District artillery depôts are by far the most important.

These are said to contain, for all arms, active, reserve, and local troops—

(1.) A reserve of material and ammunition for the current needs of peace.

(2.) A reserve war supply for mobilization, augmenting that in the hands of the troops.

(3.) A reserve war supply to make good material lost or consumed during the course of military operations.

(4.) An extraordinary reserve destined for the use of troops of new creation and for the militia, or serving to strengthen the armament of existing works, or to arm points newly fortified.

The artillery depôt of the District comes under the command of the District artillery direction. It has a Colonel in command, with a staff in three sections for artillery, small-arms, and ammunition. If stationed in an open town a detachment of local artillery is added. If in a fortress, only a small cadre for administrative purposes. An artillery workshop and a laboratory are attached to each depôt; only military workmen are here employed. A certain number of the depôts form in war mobile field workshops and mobile laboratories.

The depôts are as follows:—

Military District.	Artillery depôt.	Branch depôts.	Furnishing	
			Mobile workshop.	Mobile laboratory.
I. St. Petersburg .	St. Petersburg	.. ..	No. 1	No. 1
II. Finland	Tavasthuus ..	.. ..	..	..
III. Vilna.....	Dünaburg ...	Bobruisk	..	..
IV. Warsaw	Brest-Litovski	Warsaw	..	..
		Novo-Georgievsk	..	No. 2
			No. 2	
V. Kiev	Kiev	.. ..	No. 3	No. 3
VI. Odessa.....	Krementchug	Rostov (Don) ...	No. 4	No. 4
VII. Kharkov.....	Kursk	Briansk	..	..
		Shostka	..	..
VIII. Moscow	Moscow.	Tula.....	..	..
IX. Kazan.....	Kazan.....	Orenburg	..	..
		Tjev	..	..
X. Caucasus.....	Tiflis	Baku	..	..
		Alexandropol ..	..	No. 5
	Georgievsk .	Petrovsk	..	..
	Batoum ...	Poti	..	..
XII. Omsk	Omsk	.. ..	..	..
XIII. Irkutsk	Irkutsk.....	.. ..	..	..
XIV. Pri-Amur	Khabarovka..	.. ..	one	one

The Turkestan District (No. XI) remained apart from the depôt formations effected elsewhere between the years 1874 and 1880. An arsenal and laboratory at Tashkent are charged with the duties undertaken elsewhere by the depôts and workshops; the arsenal can turn out wheels and ammunition wagons, while the laboratory supplies all arms with ammunition; 165 Officers and men form the personnel. That of the depôt or arsenal detached section and workshops varies between 9 Officers, 35 officials and non-commissioned officers, 264 artificers, and 161 various at the capital to a dozen of all ranks at Irkutsk.

It will be noticed that nearly everything connected with the military service of these establishments in general falls to the duty of the local artillery, which has to supply either formed detachments or simple cadres. The duties of guard, escort, transport, and maintenance of order also fall upon this body. The composition of these detachments vary from 7 Officers and 450 men at Shostka, to 2 Officers and 100 men at Omsk. No other regular artillery troops are therefore required for these detached duties, and the instruction of the arm in field service is to this extent less hampered by unfavourable local conditions than that of infantry or cavalry.

B.—*Educational Establishments.*

These include all those which concern Officers, men, and special personnel of the arm of the artillery, as well as practice grounds and instruction camps.

Of the establishments which concern Officers, the *Michael Artillery War School* and the *Michael Artillery Academy* are of chief importance.

The first of these is designed to act as a preparatory institution for the

academy, and to form young Officers of this important arm. Every year from sixty to eighty students are admitted: the course lasts three years, and the three divisions are known as upper, middle, and lower class. Of these the first is divided into a "front"[1] and a mathematical section. Competitors must be 16 years of age: soldiers serving with the colours or in the reserve, whether as conscripts or volunteers, are allowed to compete: in the case of conscripts these must have served the legal period according to their degree of instruction. Youths who have completed their course at the military gymnasia are admitted without examination to the lower class. Candidates who have followed the complete course at the secondary civil establishments, or who have already undergone an examination on the subjects taught at the military gymnasia, have only to pass in mathematics and physics. Cadets from other military schools are admitted without examination into the upper class. Youths who have passed the standard for nomination to the field artillery can also enter the "front" section of the upper class: those who have finished a course of physics and mathematics at the universities or other establishment of higher education, are permitted to join the upper class after qualifying in military subjects only.

The same General Officer superintends the Michael School and Academy: councils and special organs, together with the cabinet and part of the professorial staff, are also common to both establishments; both come directly under the Grand Master and the general direction of the artillery.

As a military body the school forms a half-battery: 8 Officers making up the commissioned ranks with the usual complement of men: 27 saddle and 27 draught horses are added: for practical work it is the custom to temporarily attach the men and material required. Each year the students join the camps of instruction, and are practically instructed in fortification, topography, manœuvres, care of horses, shoeing, &c. The theoretical course includes religion and sacred history, general and Russian history, analytical geometry, differential calculus and the elements of integral calculus, physics, chemistry, elementary mechanics, tactics, artillery, fortification, military topography, artillery administration, law, translations from foreign languages, landscape, and artillery drawing.

While at the school the students class as conditional volunteers, and are entitled cadets. An examination takes place yearly. After the final one the cadets are divided into three categories: the first class are nominated Sub-Lieutenants in the artillery with two years antedate, and with their commissions dated before those of students from war schools and corps of pages who received "excellent" certificates a year before: those with second-class certificates also get two years antedate, but rank below the last-named students: those in the third class join the infantry and cavalry as non-commissioned officers, and receive commissions in these arms after six months' service. Each year some forty to fifty Officers join the artillery of the regular army from this school and five or six the Cossack artillery.

The *Michael Academy* affords higher professional education to the artillery, and trains Officers for special technical branches. Thirty Officers are admitted yearly for a two-years' course: there is a senior and junior division in consequence each year: in addition there is a supplementary course for practical work.

Officers of all arms up to the rank of Second Captain in the line and Lieutenant in the Guard may compete for either division: these must have three

[1] The word "front" (*stroievoi*) has a particular meaning in Russian military language. It applies to all that concerns the *combatant* part of the service in particular. Thus "front" Officers, are combatant Officers of any arm, "front" horse charger or troop horse, "front" instruction field manœuvres, &c.

years' service, or two if coming from the Michael School, or again for those who have obtained the grade of candidate in the physico-mathematical faculty of the universities. Officers not belonging to the artillery arm must have passed through a military school with honours, or have followed higher courses at the universities. The entrance examination covers the ground of all the subjects taught at the Michael School, but adds one foreign language. The theoretical course includes principal and secondary subjects : the former deal chiefly with artillery and applied mechanics. The artillery course is grouped into history, organization and tactics of the arm, ballistics, technology, theory of construction of guns, material, and small-arms, and administration of technical establishments. Of the secondary subjects may be mentioned higher mathematics, mechanics, chemistry, and geometry.

During the course of the summer the Officers take part in the practical work at the technical establishments of the artillery and Navy, mines. and private factories : they also visit the most important fortresses. This academy possesses a good library, a chemical laboratory, and a collection of specimens and models. After the final examination Officers are divided into three classes : those in the first class receive a step in rank, except Second Captains, who receive one year's pay as a gratuity. Officers who particularly distinguish themselves receive the cross of the academical order.

Officers in the first class, after serving in technical establishments for a year, have the option of joining the Guard. Both the two first classes of Officers may also be sent direct to the Guard and be classed in it after a year : there are, however, only four yearly vacancies. The third class includes the Officers who have failed to satisfy the examiners and who rejoin their corps.

All Officers are permitted to follow the course at the academy if they choose to pay for it, subject of course to certain restrictions as to numbers. Most of the professors are Officers on the active list. A cabinet centralizes affairs, and a council directs the administration.

Six Officers of the artillery compete for two yearly vacancies in the *School of Mines*. This course includes mechanics, metallurgy, mineralogy, and analytical chemistry.

In principle all Officers of field and fortress artillery come from the Michael School or are promoted from the ranks ; but it is not uncommon to find artillery Officers who have begun their career in other branches of the Service.

Before promotions take place from the ranks, candidates for commissions have to pass an examination at the artillery school. Volunteers have the right of competing if they have six months' service or have been non-commissioned officers three months. Men joining with the annual contingent are not given much inducement in this direction : they can only compete if non-commissioned officers, and if they have completed their normal period of service : in addition they must have held non-commissioned rank for at least two years if their liability is six years, or for one if it is four years.

In war-time non-commissioned officers are promoted for gallant service without any examination, but they are supposed to qualify subsequently.

Officers of other arms of the Service who have been through the military schools may be attached to the artillery for a year, at any time before they have completed their third year of service : if at the end of this period they pass a qualifying examination they are nominated Officers of artillery.

In principle promotion goes by seniority up to the rank of Lieutenant-Colonel : selection only takes place in lower grades than this owing to exceptional services performed. The grades of Colonel and Lieutenant-Colonel are given by selection. Promotion takes place on a separate list for horse artillery of the Guard and line respectively, for the field artillery of the Guard and line respectively, for the fortress artillery and for the horse artillery of each Cossack territory.

For the men there are two classes of schools. The first includes the *battery, park, and company schools*, and prepares men for the rank of bombardier, for the position of artificers to the batteries, and in particular for the duties of laying a gun—perhaps the most important and best neglected duty in the whole curriculum of artillery education.

Each school is directed by an Officer with one or two assistant non-commissioned officers who must have at least one year's service. The course begins within a month of the return from the camp of instruction, that is to say, in October as a rule, and lasts until a month before the return of this period of general field instruction, or about eight months in all. The course includes reading and writing, arithmetic, artillery, interior and field service, with religious instruction, and, lastly, gymnastics.

The second class of schools for men includes the *brigade and fortress artillery instructional detachments* whose duties are to form *feuerwerker* or sergeants in charge of sections: only those men are admitted who have passed the battalion and company schools successfully. Each unit sends to the instructional detachment a number of candidates equal to half its effective strength of non-commissioned officers; all these must have at least two years' service, and have taken part in one camp of exercise. The brigade fortress artillery commandants select the instructors at the rate of 10 per cent. from the candidates, and those selected remain with the instructional detachments for at least two years with increased pay. The course includes the elements of the Russian language; fortification (for fortress artillery only); care of horses and shoeing (for field artillery); the service of artillery, duties of non-commissioned officers, religion, gymnastics, and riding (for field artillery only). Batteries have to supply horses and material. In the fortress detachments the men are trained, as far as possible, with all the various types of guns, carriages, and hydraulic arrangements in service of the fortress artillery: a large covered shed contains types of most of the calibres for purposes of instruction in winter. If the men cannot be trained to the service of every type of gun it must be noticed that since fortress artillery are essentially localized troops as regards peace garrisons, they are always in a position to be trained with the guns in the armament of the particular fortress with the defence of which they are primarily concerned.

As regards the non-combatant personnel, there are four schools of some importance, namely, the *Technical and Pyrotechnical Schools* at St. Petersburg, with 100 students each, who are trained as foremen for the technical artillery, and the two *Armourers' Schools* at Tula and Ijev for 220 pupils in all. All the courses at these schools last four years, and youths are not admitted under sixteen at the technical schools, nor under seventeen at the armourers' schools.

The artillery polygons, which answer to Okehampton and Shoeburyness, were instituted in order to develop the practical knowledge of Officers and non-commissioned officers, as well as to serve for the execution of experiments. Each has a practice range and a government library. It is provided with all the service types of fortress, siege, and coast material, pioneer tools, &c. A Colonel is in command at each polygon under the Artillery Chief of the District. Practical work takes place during the summer, and certain corps and batteries are annually told off to take part in the practice; combined exercises of artillery and engineers are not infrequent. There are eight polygons, namely, Oust-Ijora (St. Petersburg district), Orany (Vilna), Warsaw, Kiev, Nikolaiev (Odessa), Tchougouiev (Kharkov), Moscow, and Tiflis (Caucasus). These are, it must be noticed, by no means the only land ranges in Russia, for the army has peculiar advantages in this respect over every other European artillery.

The last instructional establishment which calls for remark is perhaps

destined to be the most important of all, namely, the *Officers' School of Gunnery* established at St. Petersburg in 1883, replacing the field and horse artillery batteries of instruction, which performed a somewhat similar duty up to this date. The object of this school is to "complete the theoretical and practical instruction of senior Officers of artillery, to form skilful battery chiefs, to advance the science of gunnery, to spread correct notions on the duties of artillery in battle, and to insure uniformity of gunnery instruction in the field batteries." This school is directed by a member of the artillery committee,[1] but the thirty-five Officers admitted yearly—or about one Officer per ten batteries—come directly under the orders of a commandant. The Officers are chosen from those who expect shortly to be placed in command of batteries, and field and horse artillery batteries are attached to the school. The course lasts seven months, from the 12th February to the 12th September; it is divided into a theoretical and practical course. The first lasts till the end of May; the second till the middle of September. The programme during the first period is as follows:—

Artillery.—Solution of problems. Study of the ballistic properties of field and mountain guns and small-arms of different patterns. Use of range-finders. Foreign artilleries. Repair of material in the field.

Tactics.—General notions on the artillery fight. The three arms combined. Battles. Solution of tactical problems and the war game.

Veterinary.—Anatomy and care of horses; shoeing.

During the second period all kinds of fire are executed with the various types of field and mountain guns; tactical problems are solved on the ground, gun pits and epaulments for field artillery constructed. The Officers under instruction also visit the artillery establishments, assist at the experiments at the Ohkta polygon, and attend the musketry course of the regiments in the St. Petersburg district. Lastly, they go through a riding class, and are put through all the details of the administration and instruction of a battery.

From this brief enumeration of the instructional establishments, it is evident that the schoolmaster is hard at work training an arm which, without science, without technical skill and without efficient handling, is only an encumbrance to its friends prior to becoming a trophy to its enemies. Whether or not the efforts directed towards improvement have been successful must be reserved for consideration in the general question of artillery tactics and training.

C.—*Remount Depôts.*

The remount service of the artillery is carried on in much the same way as in the cavalry.

During peace the horses destined for the batteries are forwarded to some point in the District as ordered by the artillery commandant of the District. In time of invasion the depôts continue to send their horses to the corps or not according to orders received. If the ordinary routine is not abandoned, the horses are given to the reserve batteries or receive a special destination; if the service be stopped or the theatre of war be in a foreign country, the needs of the army are in principle met by requisitions. As in the cavalry, horses are supposed to be fit for service for nine years, which may be extended to eleven if recommended; but the number of these is not to exceed the number of annual remounts or one-ninth of the strength. The horses join their corps between the 15th September and the 15th October. Three days after their arrival they are inspected by the chiefs of batteries, then by the brigade chiefs, and lastly by a special commission. After this the corps are

[1] At present Lieut.-General Chklarevitch.

responsible for the animals. For the artillery of the Guard horses must be from four to seven years old, and 14.3 to 15.1 hands; for the line they must be from three to six years for riding, and from 14.1 to 15.1 in height; for gun draught from four to seven years, and from 13.3½ to 15.1; for ammunition draught, already noticed to be excessive, from four to seven years, and from 13.3½ to 14.3; lastly, all horse artillery animals must be from 14.1 to 15 hands. One-third of the remounts may be mares, but entire horses and mares in foal are not allowed. The colour is kept the same in each battery and must be dark. For the purchase of horses for Guard artillery, a maximum of 207 roubles is allowed; for Guard ammunition wagon teams and line gun teams 125 roubles; for the line ammunition teams 100 roubles. In these sums are included the whole cost of purchase and keep of the animals up to their arrival with the unit for which they are intended. More than three quarters of the horses selected each year come from the Don district.

It is difficult to imagine a team of six 14.1 horses, worth 16*l.* each, dragging a heavy gun and limber of 41 cwt. It is even more difficult to conceive a team of six 13.3½ animals, which is approximately the standard for Indian polo ponies, and worth under 12*l.* each, getting through a few weeks' campaigning with a weight of 42 cwt. behind them. This question affects considerably, as will be seen, the question of artillery tactics.

V. Artillery Training and Tactics.

All the conditions which react so unfavourably upon the drill and training of infantry and cavalry exercise an equally prejudicial influence upon the annual march of instruction in the scientific arm. Among these primary causes for the comparatively low standard of military education in all branches of the Service may be mentioned, first and foremost, the long and gloomy winter during the whole of which period practical outdoor military training is dead, save for here and there a few experimental marches and manœuvres due to the initiative of some zealous subordinate commander. It is true that in principle theoretical instruction is given during this period, but theoretical instruction falls on very stony ground when an attempt is made to sow its seeds among illiterate peasants, and it is difficult to imagine a greater contrast than that presented by the programme of work in Russian barracks during the winter and that of Western nations more favoured by climate. The absurd number of holidays during the year also interferes greatly with the work of the Russian schoolmaster: there are 6 in November, when the "winter course" begins, 16 in December and January, 13 in February and March, and 14 in April, or 49 days in all absolutely wasted as regards military training during the winter: in addition the number of ceremonies and religious observances which have to be performed and observed by all arms, the celebration of anniversaries, birthdays, patron-saint days, and so forth, occupy not less than from ten to fifteen days; so that it may be said that one-third of the six winter months, or two months in all, are entirely wasted—always in a military sense of course, for according to the Russian saying, "The prayers made to God and the services rendered to the Tsar are never lost."

If we add to these lost months the amount of time wasted with semi-oriental indifference at other periods of the year: if we recall the fact that all horses in the artillery of the line are turned out to grass for a month in autumn, it will be found that fully three months out of the twelve must be deducted in order to arrive at the real period devoted to professional instruction in the artillery arm. This deduction is not as great as that which might be calculated as the average in the case of the infantry: the reasons for this are, first that, thanks to the development of railways, it has become the rule

for the batteries to be carried to and from the polygons and instruction camps by train for a great part of the journey, thereby economizing time ; secondly, that the winter furloughs, which are one of the most disturbing influences upon the training of the infantry, are much less extensively permitted in the scientific branches ; and lastly, that guard, orderly, and fatigue duties fall less severely upon them. All these causes, combined with a nominal six years' liability, naturally afford far greater facilities for training than in the case of any other branch of the Service. Again, the latitude left to the arm during the selection of recruits allows it to monopolize the better elements of society with the exception of the volunteers who are permitted to choose their corps : of this monopoly the arm freely avails itself, and in consequence the general standard of education, although very low, is not so bad as in the mass of the line. Next to the corps of Guards that of the artillery has always produced the larger proportion of intelligent Officers in Russia : it may even be questioned whether it has not almost a better general level of scientific knowledge, even if the greater facilities for education within reach of the higher ranks of the nobility produce finer intellectual exotics in the favoured corps. Perhaps this accounts for the fact that the artillery Officers have as a body been generally known for their liberal ideas. Conrad Rylejev, poet and rebel, the two Borisovs, Gorbatschevsky, Pestov, Kerejev, Colonels Borstel and Jentalzov, with many other Decembrists, and last, but not least, Michael Bakunin—all served in this branch of the Army.

If the proportion of admissions to the Nicholas Staff Academy be taken as a rough guide, it will be seen that in some years nearly half the successful candidates have belonged to the artillery, and four-fifths of these latter have been serving in the artillery of the line. Nor will it have escaped notice, in the description given of instructional establishments, that the schoolmaster is decidedly abroad in the Russian artillery, and that a really strenuous effort has been made to give a sound scientific education to the Officers and non-commissioned officers of an arm which, without this education, is valueless. It is not for a moment suggested that the Russian artillery is the equal of that of England in smartness and manœuvring power, of the German artillery in mobility and accurate shooting, or of the French in scientific acquirements and technical excellence, but, what does appear very strongly, and what may prove a most important factor in the highly complex problem of Russian power, is that the artillery, as an arm, is considerably in advance of the credit it possesses among foreign artilleries, due partly to the general ignorance of its composition and partly to the lessons of the last war in Bulgaria which seemed—and seemed rightly—to all observers to have proved a great absence of efficiency both in material and in leading.

That service is six years in the arm does not go for so very much when we deduct the allowance that has to be made for the peculiar conditions which attach in Russia to the profession of arms in general. If three months a year are thus struck off as time wasted, it is evident that six years' service in Russia would be the equivalent of $4\frac{1}{2}$ years under other conditions or in other countries.

Making a further allowance for the low standard of education of the annual contingents in comparison with that of other States, it will probably be true to say that, owing to a number of causes which militate against efficiency, just so much can be taught the ordinary gunner in his six years as would be the case in Germany in three or in Austria in $4\frac{1}{2}$ years. Even then it would be impossible to balance the solid advantage which must always be on the side of a nation with an inexhaustible fund of well-educated youths at its free disposal as rules in Germany. Nevertheless, in spite of the many unfavourable conditions of service which undoubtedly beset all instruction in Russia, the artillery now described, thanks to its enormous development,

which promises superiority in guns upon the battle-field ; to its depôt system, which enables loss of men and guns to be made good ; to the fair standard of instruction of its corps of Officers, and to the completeness of its armament may, with good handling, prove distinctly a redoubtable arm. Even German critics, always chary of praise when any other service but their own is in question, are beginning to admit the fact. Thus a well-informed writer in the *Neue militarische Blätter*,[1] in a lengthy criticism on the Russian Army, states that in his opinion the artillery is the best instructed arm of the Service, and that it has made great strides in advance since the last war.

In the matter of drill, the programme of the annual course is generally divided into three periods : the first period lasting from the 1st October to 1st December, the second from this date to the 1st May, and the third including the time passed at, or on the march to and from the summer camps. In the first period the men selected for the battery school and brigade instructional detachments are examined, these detachments made up and trained to their work, drivers from men of one year's service selected, riding, gymnastics, gun and foot drill practised, young horses broken in, and theoretical instruction given. At the beginning of the second period the recruits make their appearance, and the early part of the time so given up to their instruction in rudimentary battery work. Drill with horsed guns begins in March or April, if possible, and in any case standing gun drill and instruction in laying guns is proceeded with in order to get the battery in serviceable order at the earliest moment for the polygons and summer camps. No regular course for the summer months is prescribed, although programmes have been issued for general guidance. As a rule batteries take it in turn to visit the practice grounds and complete their annual firing. The allowance of ammunition for each battery is 246 rounds a year, namely, 128 shell, 108 shrapnel, and 10 case : part is retained for inspection time when field-firing takes place. The time employed at practice may be taken at about six weeks yearly : the batteries are generally moved to the ranges in their own districts at varying dates between May 13 and the beginning of the camps. Some of these land ranges are not at all suitable for their purpose according to Russian ideas. At Kiev, for instance, the range consists of an undulating plain with a number of small hillocks covered with brushwood, rendering all shooting very difficult.

It has been noticed that the summer camps which afford almost the sole means for practically training the Russian Army in combined manœuvres and regular field exercises were only originated in the year 1872, and that they did not receive their full extension till some years later : it may be said, in short, that almost up to the period of the Russo-Turkish War, the artillery, as an arm, was not practised in the shifts and expedients of camp life, that it was not capable of long and rapid marches owing to its ignorance of the conditions of field service, and that the senior Officers had no skill in employing batteries in mass or in conjunction with other arms, since these things had either not been practised at all or had been practised on a limited scale and in quite an inadequate and perfunctory manner. But in the last ten years it has been quite a different story. Anyone who glances over the lists of the numbers of batteries which have taken part in these manœuvre-drills—taking a few years at random—will notice that in the year 1874, for instance, there were 118 guns present at the two camps formed ; in 1875 the troops were concentrated at thirty-five different points, and at fifteen all arms were represented, and 128 batteries took part in the manœuvres. In 1881 this number rose to 295 batteries, and in 1882 was 267. These numbers have been approximately maintained up to the present date. It is therefore evident that the facilities

[1] February 1887.

for self-education afforded to the senior Officers of the arm are far more extensive and far more valuable than formerly, and although the history of all war makes one doubtful whether senior Officers, as a body, allow their actions to be much shaped by new experiences, still a very great improvement in troop leading will probably be shown in the next campaign.

Where the Russian artillery may fail by comparison with German artillery is first in mobility, and secondly, in hitting power, and these two points of inferiority will go far to compensate for the prodigious deployment afforded by a powerful organization. "They seem to have strange notions in Russia," says a German critic, "on the regulation of fire, and the effect to be obtained from shrapnel." It is true that a great number of practice returns show a fair percentage of hits, and that the question of firing against and hitting troops behind cover has been met by the use of shrapnel with reduced charges, with a certain measure of success, but it would be unwise to take the lessons of the practice ground as sufficient. To begin with, the rate of firing at these exercises is far from attaining the necessary degree of rapidity; at the ordinary competitive practice a battery will take an hour or more to fire sixteen or twenty rounds, and this custom of slow shooting has become such a matter of habit that it serves as a basis for calculating the normal expenditure of ammunition. But even if a battery is able to fire 30, 60, or even 70 rounds an hour in practice, this rapidity of fire is still insufficient in a great many instances, particularly if the enemy is in possession of a numerous, formidable, and well-trained artillery. If we allow that a battery should, under ordinary service conditions, be able to fire three rounds a minute without prejudice to accurate shooting, this number will amount to 180 rounds an hour. The Germans allow 3 to 4 rounds a minute for ordinary cases, and from 6 to 8 rounds for rapid firing during a short space of time. Of course, very rapid firing would only be required for a comparatively short period under ordinary conditions, but it is just at this moment when the difference would be most marked between a slow- and a quick-firing battery; in the first case the battery commander would not be able to control his fire, which would become independent and comparatively useless.

Rapid fire is the decisive fire: to expect gun detachments to succeed in a matter in which they are not trained is only to prepare disappointments for oneself.

The importance of obtaining the mastery in the artillery duel which, under ordinary circumstances, precedes a great battle increases in direct ratio with the power, range, and accuracy of modern guns. Whatever opinions one may have on long-range and rapid fire as an infantry question, there can hardly be a doubt upon the subject from the artillery point of view. It is evident that given two opposing batteries with equally powerful guns and equally well-trained gunners, the battery which can succeed in firing 180 rounds in the hour will be three times as strong as the other which is only able to fire 60: that is to say, that one battery of six guns able to keep up its effective fire under the first conditions can engage on level terms three similar batteries firing sixty rounds an hour. The Russians have not paid sufficient attention to this matter: on the other hand, the text of the artillery field exercise and instruction hand-book has the advantage of being very general in its advice; it does not attempt to dogmatize or provide for meeting, theoretically, every possible contingency. Some few authorities think that so long as gunners are properly trained they can always rise to the level of the occasion, if a very rapid fire is demanded by circumstances. Artillery, it used to be said, has no nerves. But this was in the old smooth-bore days when artillery approached to within shouting distance of the enemy before it opened fire. Loading and firing was machine work, and whether the round shot bounded once twice or three times before reaching its mark mattered very little, and great accuracy

of laying was not indispensable. But the service of modern field artillery requires the greatest possible attention to every detail; if the distance is miscalculated by 50 yards in 2½ miles, if the shrapnel time fuze is set too long or too short, if the nerves are not steady when the sights are raised or depressed, or the movable collar of the percussion fuze turned, the round may be lost and the effect may be *nil*. All the operations of preparing fuzes, of laying and of firing, require the greatest nicety, and demand great accuracy. If modern science has endowed artillery with renewed vitality and power, it has detracted from the value of its gift by rendering gunners in their turn accessible to those impressions which have always influenced the behaviour of other arms.

Among other causes besides that already mentioned, which tend to reduce the hitting power of the Russian artillery, may be mentioned the Le Boulengé range-finder. This instrument was employed during the last war, and was adversely reported on, particularly so by the authorities in the Caucasus. Trials took place subsequently, but failed to substantiate the truth of the assertions made against it; in consequence a fresh and large supply was ordered,[1] with the curious result of forcing on the artillery a range-finder which had been proved bad in the field, simply because it had stood the tests of peace trials. The misuse of two things, the range-party and the range-finder, has for many years robbed the annual practice of more than one field artillery of half its value. Russian gunners are still trained by adventitious aids to ignore what has been long recognized and rigidly enforced in Germany, namely, that practice in peace under conditions unobtainable in war is worse than waste of ammunition, and that the gun can and must be made its own range-finder.

If the question of hitting must, after all, be decided on the battle-field alone, the other weak point of the service appears very strongly in the every-day life of a battery. The Russians are very proud of their heavy guns, and declare that this weapon, with a charge of over 4 lbs. of powder, and a shell or shrapnel weighing 27 lbs. 8·6 ozs., has no equal in the world. But however much credit the artillery authorities may deserve for so rapidly designing and placing in the hands of batteries a good type of heavy gun together with its equipment, a matter which we have hitherto entirely failed to settle, it must be remarked that the result has been achieved at great sacrifice of mobility. Want of mobility, in fact, characterizes the whole of the artillery service, and more particularly the ammunition train. Taking our new 12-pr. guns for comparison, with a weight behind the teams of 37 cwt., which is quite the outside limit for use with horse artillery, even with English horses, it appears that this weapon is superior in every respect to the Russian light and horse artillery guns.

The Russian horse artillery gun has a weight behind the teams of over 32 cwt., that of the light gun is 36 cwt., and that of the heavy gun over 41 cwt.

As regards the first-named weapon, the outside limit of weight, 615 lbs. a horse, has been reached, compatible with the power of manœuvring with cavalry, and of draught by Russian horses. But the ammunition wagon has a weight behind teams of over 42 cwt., or 787 lbs. a horse, and nothing appears more clearly than the fact, that these wagons are incapable of following even field batteries across country roads with due rapidity, partly owing to the heavy weight of the wagons, partly to the low price, small height, and indifferent power of the horses, and in consequence, to expect their aid in an action of cavalry is to lean on a broken reed. Almost every German notice of manœuvres in Russia refers to the difficulty of keeping these wagons on a

[1] 814 in 1883.

level with their batteries, which naturally receive the pick of the remounts. As for the heavy guns, the weight behind teams is just as excessive as for the ammunition wagons, and in any future campaign the instances will probably not be rare of the Divisions being unable to bring their heavy guns into action. Russia has calculated the weight behind teams as if her guns were horsed like the pick of the English batteries, instead of by Russian horses, which after all cannot compensate for want of draught power by any amount of endurance. Nothing indeed is more striking in connection with the question of mobilization than this uselessness for military and particularly artillery purposes of the great mass of Russian horses. The fact is, that although the numbers of these are very great, since the unit of labour in Russia has from time immemorial consisted of a man, a woman, and a horse, the quality is very poor; the great mass of the horses belong to the peasants, and are quite incapable of doing duty in an artillery team; it will also be found that the supply of strong draught horses is a real difficulty. Hence the question of mobility assumes much importance, for if the absence of this invaluable quality is notorious in peace, when affairs work smoothly and full rations are always obtainable, how far will it affect efficiency during the stress of a bitterly contested campaign fought out under climatic conditions which must be taken as they come? If again the horse artillery batteries, growing weary of the dead weight which impedes the celerity of their movements, take heart of grace and leave their wagons behind them, they will have to engage with only 7 shell, 10 shrapnel, and 3 case per gun, and may be rendered harmless in half an hour's engagement. If the common saying is right that the speed of the squadron is the speed of the slowest horse, it is equally true that the mobility of a battery is the mobility of its ammunition wagon, since without projectiles a battery is only as useful as a steam engine without a tender. If this want of mobility still exists, it affords proof that the Russians are unable to improve, since it was pointed out most forcibly in the official reports which followed some partial essays of mobilization in 1881.

In the field the battery occupies normally 200 paces of front, but this may be reduced to 45; in action the limbers reverse and draw up with the leaders 20 paces in rear of the trail of the gun. The ammunition wagons are 50 paces in rear of the guns; this is the ordinary peace arrangement, and the Russian battery in action thus presents a mark 200 to 45 paces by 100: every projectile exploded in this rectangle is almost certain to produce some effect. It may be said this is only a drill formation, but in such a case everything useless is dangerous.

The employment of artillery in mass is perhaps the most difficult manœuvre of all for the command of the arm, but it is a characteristic of modern war that has to be provided for. This formation of masses of guns in a long single line, the choice of positions, and the proper direction of fire, demand a professional ability that experience on a grand scale alone can afford. General Gourkho, who is always zealous in the cause of improvement, prescribed in 1884 some manœuvres of this kind near Warsaw, which duly took place under the direction of General Pavlov. According to the *Militär-Wochenblatt*,[1] these were found "very highly instructive; all those who took part in them were convinced of the great difficulties of employment of artillery in mass, and more particularly of the due indication of the objective to such a large number of guns. Experiment alone is capable of deciding the rules necessary for this complex question; the handling of masses of guns must therefore be frequently practised, and all details of the employment of these great batteries

[1] No. 85. 1884.

must be seriously weighed and considered, since the result of success will be of immense importance."

General Gourkho, it may be incidentally mentioned, has always been the most rigorous critic of shortcomings in the artillery, since he is persuaded that if success can be achieved by this arm, or if it can duly support the excellent qualities of the infantry, Russia can laugh at her foes. It is almost the rule for the artillery to come in for hard words when they are passed in review by the authorities; thus, a few years ago, General Gourkho, at Krasnoe Seloe, and General Albedinski, at Vilna, spoke out strongly on the ignorance, the want of scientific knowledge, and the inaccuracy of the shooting displayed: "Only a well-reasoned method," said General Gourkho, "can give artillery fire a powerful effect in war. During my inspection, I have not noticed the application of such a method." This was in 1879; thanks to the initiative of a few able reformers, the progress in recent years has been considerable.

It may be said: "We have seen the Russian artillery campaigning; it proved itself a very indifferent auxiliary to the other arms; it was generally behindhand, it often fired very badly, and at Plevna its material effect was almost *nil*. We prefer to accept the lessons of that war to all the visionary lessons of peace training."

But one cannot dismiss the past twelve years in such a summary fashion, nor refuse to peace training that measure of progress which after all is its chief reason for existing. As for Plevna, field artillery is not intended for use against an army that goes to ground as Osman's did; it is intended for the *Massenschlacht*, or the shock of great field armies. If Osman and his troops fought gallantly and well, and by their spade-work rendered the numerous Russian guns harmless, they nevertheless prepared for themselves by their action the germs of strategic death, none the less certain because it was slow.

The Prussian artillery in the war of 1866, if it always did its duty, certainly failed to cover itself with glory, and although half the Prussian batteries were armed with rifled guns, the artillery as an arm was overmatched in every action by the numerous and formidable artillery of the Austrians. But the Prussian artillery laid the lesson to heart; under able guidance it rose to the level of the occasion, and in the next campaign certainly equalled and almost surpassed in energy and zeal, not to speak of material effect, the action of the other arms. With every respect for the precedent of 1877, it must be remembered that some time has passed since then; that even if Russians themselves had not reflected upon the meagre results gained by their artillery, there were plenty of unfriendly critics across the Vistula to bring the lesson home with all the superior cynicism that is the peculiar attribute of the German military critic.

The want of all rules for guidance of artillery chiefs in the war in Bulgaria was severely felt. Immediately after that campaign, the Grand Master called upon Major-General Gregoriev, who had acted as Chief of the Staff in the second phase of the war, to draw up at once a programme for future guidance. When this was done, a special commission, presided over by General Count Barantzov, examined it, and introduced a few alterations. General Count Milutin, Minister of War, rapidly passed the programme, and handed it over to chiefs of corps to be reported on. This method of drawing up a manual of field exercises appears sound. If a committee is appointed for the work the inevitable result is an invertebrate regulation, the result of a compromise between the conflicting opinions of the members of the assembled body; if, on the other hand, a single individual is given the task, without let or hindrance, the work is marked by his peculiar *cachet*, and the tenets he holds may be unsuitable to the Service in application. If, on the

other hand, one and the same hand draws up the general scheme, the advantage is gained of a single purpose running through the whole, and the idiosyncracies due to the personality of the author are toned down by the reporting commission. Lastly, chiefs of corps who have to practise the theory are the best practical judges of regulations, and every programme must take their opinion into consideration.

The general ideas which now govern the Russian artillery world are not greatly at variance with those accepted elsewhere.

The sagène[1] is usually adopted as the unit of measure in estimating ranges. Thus, 500 sagènes and below are called short distances, 500 to 1,000 sagènes middle distances, and over 1,000, long distances. Over 1,300 sagènes, it is considered that shells bury themselves into the ground owing to their considerable angle of descent, that the effect is hardly worth the ammunition; at 1,000 sagènes, and on hard ground, it is considered that the best effect can be gained. Shrapnel is used with effect up to 1,200 sagènes, and case from 50 to 150. As a rule, it is laid down that guns are not to open fire at over 1,300 sagènes, since at this range the observation of the burst is very difficult, ammunition is wasted, and the enemy gains confidence from the harmless display; fire at over 1,500 sagènes is only advised when it is required to demonstrate; the best effect is expected between 700 and 900 sagènes.

Since the light gun has a flatter trajectory and more accurate fire than the battery gun, it is recommended for use at the long ranges; at short distances, where rapid fire is required, and artillery has to follow closely the movements of the other arms, the light gun is also preferred, since it is more mobile, and has a greater number of rounds at its disposal. At middle distances, on the contrary, the powerful effect of the heavy projectile is expected to gain great results, while much is expected from it against entrenchments, troops in villages, and resisting cover generally.

The fire of an isolated battery is directed by its chief conformably with the orders received from the commander of the next higher unit. When a number of batteries are united under the orders of a single Officer, the fire is still regulated by batteries, while the general guidance and control belongs to the chief.

Fire is recommended to be slow early in the action, at a range of 1,200 sagènes or thereabouts; it increases in rapidity up to 700 or 900 sagènes, and at shorter distances becomes intense. In very rapid firing it is laid down that two rounds per gun every five minutes may be fired, less than half the rapidity of fire of a well-trained English battery under similar conditions. With this fire, it may be remarked, the entire ammunition of a heavy Russian battery would be expended in $5\frac{1}{4}$ hours, that of a light battery in 7 hours, and of a horse artillery battery in $7\frac{1}{2}$ hours.

A reconnaissance always precedes the choice and occupation of positions, and is conducted by the commandant of the arm on the field, or of the unit employed. It is recommended to come into action with loaded guns when it is required to open the action at once; the Russians seem scarcely alive to the fact that the necessity for rapidly firing the first round in an action has given place, under modern conditions, to the necessity for being able to cover long distances by rapid marches. Artillery actions now begin at such immense distances that batteries will, as a rule, be able to unlimber unperceived, and the usefulness of their fire will depend, not upon the favourite theatrical folly of letting off a round as quickly as possible, but by the careful calculation of distance and observation of the effect of the first few rounds.

The chiefs of the various units of artillery are, according to the regulations,

[1] 1 sagène = 7 feet.

the *auxiliaries* of the chiefs of troops under whose orders they are placed. They must, therefore, be kept fully informed of the projects of the latter, and for this purpose accompany them on reconnaissance; during a fight they keep up communication with them, and make the best arrangements possible for the successful action of their particular branch. Unity of action and concentration of fire are recommended, but the organization of the artillery often obliges the batteries to be distributed among brigades and even regiments of infantry. This is the radical fault in the tactical organization; the commander of the artillery brigade has to exercise supervision over six batteries of forty-eight guns, with all their ammunition trains and services. These, at the normal intervals, occupy a line of 1,320 paces, a front of action quite beyond the control of a single individual, quite apart from the question of the number of guns; the German *Abtheilung*, with just half this number of guns, is a far better and more handy tactical unit in the fight. When batteries are detached from the brigade, the commander of the latter ceases to exercise tactical supervision over the detached fractions, which, in their turn, only refer to him on technical artillery matters; it is the chiefs of troops, under whose orders the batteries are directly placed, who dispose of them upon the battle-field; the brigade chief can only intervene with the assent of these, or by virtue of superior orders.

By the same general rule the artillery commandants of Armies and Army Corps, not having a certain definite number of batteries directly under their control, have no orders to give the Divisional artillery except on technical subjects; they control the tactical handling of the arm only when the chief of the Army or Corps judges it expedient to mass a certain number of batteries under their direct orders at a given moment of the action and for some particular purpose. In fact it is everywhere most distinctly laid down and universally recognized that it is the chief of the troops with whom the artillery is acting who, throughout all fighting units from highest and lowest, has the right and the duty of controlling the action of his auxiliaries and the titular chief is unable to contravene this authority without special orders from higher authority.

The commander of the battery gives all directions to the fighting unit under his command; this unit consists in war of the battery guns, the first échelon of 4 ammunition wagons, 50 paces in rear, and a second or reserve échelon, 400 paces in rear, consisting of the remaining ammunition wagons and battery details; two spare teams only are kept in the close vicinity of the guns. The reserves of several batteries may be grouped together.[1] All these distances and dispositions may be modified in detail according to the requirements of the case.

When the brigade is united the commander directs the fire of the batteries; if the Division is acting independently, the flying Divisional park comes under his orders; otherwise it is under the chief of artillery of the Army Corps. This Officer selects its positions, makes it known to the troops concerned, and is generally responsible for the supply of ammunition. Some critics say that the only duty of his office is to scour the plain in search of projectiles for his batteries, but it seems probable that his actual command on the field will be made up of the batteries belonging to the infantry and cavalry reserves not employed in the early part of an action, which will probably be united with the guns of the infantry engaged near the position chosen for the massed batteries. The same remark applies to the functions of the artillery commandant of the Army, but it is very improbable that his influence will ever be directly noticeable on the field of battle.

[1] A certain class of Officers at the French *écoles de feu* support this idea, but it is too much like "all the eggs in one basket."

Generally speaking, the importance of deploying a formidable artillery at the outset of a fight is fully recognized, but part of the guns are usually held in reserve till the situation becomes clear. Lateral movement of batteries is generally deprecated, it being considered that the object can be better gained by the sudden onslaught of a large number of fresh batteries. In general, if an infantry Division is acting alone two light batteries are held in reserve at the beginning of the fight and with a cavalry Division one battery is held in reserve. This arrangement, which is carried out by all units, is in distinct opposition to the German principle of thrusting forward every available gun from the earliest moment in the action. From this fact a very curious situation results; in the German Army where Corps artillery exist, it is not used as reserve artillery at all, and in the Russian Army where there is no Corps artillery this reserve is artificially created on the battle-field. Apparently the Russians, not caring to further imitate their neighbours in organization, determined to create a Corps artillery under another name, with this result, that the dispositions made combine the double disadvantage of splitting up commands unnecessarily, and of forming of set design an échelon of batteries which is in fact nothing more than a return to the antiquated heresy of a *reserve* artillery.

For what purpose is this reserve? To guard against surprises, say the Russians, and to await the moment when the course of the action becomes clear. Then the advance of the fresh batteries at the critical time and place will be decisive of victory.

But this is an argument of smooth-bore days when, owing to the shortness of range, an artillery once thrown forward into the fight was lost to the command for employment elsewhere on the field, since, once in action, it was within a few hundred yards of the enemy's position and was materially influenced by all the varying vicissitudes of the combats of all arms. At this epoch the retention of artillery in reserve had a meaning and the employment of it at the right place and time was frequently decisive. But to-day this reasoning is true no longer; fire is opened at immense distances and artillery remains up to the last at the free disposal of the command, which can begin and break off an artillery action with far greater ease than formerly, and without compromising the other arms, since the latter, owing to the great range of modern guns, only come later into action.

The Germans, after the war of 1866, changed the designation of the "reserve" artillery to "corps" artillery. The philosopher might ask, What's in a name? but to soldiers the change of title was perfectly comprehensible, and the leading of the arm participated thenceforward in all the pushing forward, energetic action which had already characterized so notably the command of the infantry.

Without returning to the letter of the old system the Russians are infected with its spirit, and the result will scarcely prove advantageous to them. Let us imagine a contest with equal numbers of Germans and Russians on either side. The Germans will not only hold their guns well forward in the columns of route, but will seek at once to thrust them into action to form a solid framework for their order of battle; every available gun will be at once pushed up and an effort made to immediately establish a command over the hostile guns. On the Russian side these will be answered by the scattered batteries belonging to the infantry Divisions in first line; these, inferior in numbers and trained to a slower rate of firing, will begin the fight with all the chances against them. They will be reinforced by the batteries belonging to the infantry Divisions of the reserve; but reserve troops are generally some distance from the front line of battle; the roads—and it is merely euphonism to call the country tracks of Russia roads—will be filled with marching columns. The want of mobility already noticed will not fail

to exert an evil influence, and even if the batteries at length unlimber and open fire, they may be too late to save their comrades from defeat, when they, in their turn, would be exposed to the united and concentrated fire of the hostile guns. Such is the natural course of events from the opposite tendencies of these two artilleries; and it is not too much to affirm that the logical result of the Russian system has not been argued out, for it is admirably adapted for the destruction of Russian artillery in detail by an enterprising foe. The recommendation at the end of General Gregoriev's regulations for artillery to sacrifice itself at the critical moment regardless of loss seems therefore quite unnecessary.

Most of these regulations deal with the offensive combat; there is much less advice and fewer recommendations for the defensive battle. In general the advantages of the defence are merely pointed out, and a large number of batteries are held in reserve at the outset of a fight. One disposition lays down that the artillery duel is to be avoided if the hostile artillery is superior. But who shall say when this is the case? The only method for deciding this question is by this very duel which is to be avoided so carefully, and the disposition at once falls to the ground as unpractical. Of other details may be noticed the paragraph which lays down that "it is advantageous, when the ground allows, to erect, parallel to the gun epaulment, but some 30 to 50 yards in advance, other works behind which there are no guns so as to deceive the enemy." Lastly, the Russians go in greatly for firing over the heads of their own troops. Some few years ago General Todleben executed a series of experiments, and subsequently it was laid down that during an attack on entrenchments, artillery was to go on firing up to the last moment, immediately preceding the final rush, and that its fire was not then to cease but to be directed over the heads of the attack upon the probable advance of the enemy's supports. To those who object that many accidents would happen in the field, the Russians reply that if this is allowed to interfere one might as well give up firing guns at practice in peace owing to the occasional bursting of a gun.

Such, then, are the general principles which govern the action of this important arm in Rusia; they do not differ extensively from what is accepted elsewhere, but they are open to criticism on some points in conjunction with the many disadvantages from which all training suffers in the Empire.

But the training and employment of field batteries, although without doubt the most important duty which falls to the lot of the service, is far from being the whole duty of an efficient artillery corps under modern conditions.

A comparison of the effect obtained by the French artillery in the defence of Strassburg and in that of Belfort, the evidence of Colonel Denfert, who commanded at the latter fortress, as well as of a large number of German artillerymen who took an active part in the sieges and investments of the war of 1870–71, prove to demonstration that one of the chief causes for the bad defence of the greater number of French strongholds lay in the absolute want of Officers and men of a fortress artillery trained in peace to all the manifold duties of siege warfare.

In 1873, Lieutenant-General Fersmann and Colonel Chklarevitch laid down very clearly the principles which should guide the training of this service, and their programme, circulated unofficially, formed the basis upon which the future instruction of this branch of the artillery was framed.

The fortress artillery is intended in Russia both for the attack and for the defence of fortresses, hence its practical exercises include a general military instruction in accordance with these duties, and a special technical training with artillery material. The special course of fortress artillery includes siege and fortress artillery drill and practice; execution of secondary operations and armament of works of field and siege fortification; construction of

siege batteries and counter-approaches; preparation of mines; musketry; fortress manœuvres and polygon constructions. In addition, the fortress war game is recommended as a most useful and valuable means of instruction for Officers.

These exercises are of a varied nature, and the following rules are suggested in order to gain good results:—

(1.) Instruction must be simplified as much as possible, more particularly for the lower ranks; this simplicity is gained by a careful division of labour, and next by the strict definition of the duties of all ranks.

(2.) All the "open" season which can be devoted to practical exercises must be divided between the different duties already pointed out. The capital point is, however, *gun practice*, and all the rest only gains importance from its relative influence upon this first requirement.

(3.) In order to create a serviceable body of gunners, the German method of training is strongly recommended.

This method consists in handing over to each company for an entire year a single particular calibre of fortress ordnance (9 c., 12 c., or 15 c., long or short), and of training the whole of the company's recruits solely with this particular type of gun; only those men who remain longer than one year with the colours have the opportunity of becoming acquainted with the other types; in the practice shooting the company retains the same gun. The results obtained from this practice are most remarkable; a solid and rapid instruction is gained, which perhaps Germany may some day have cause to congratulate herself upon.

(4.) Regulations, instructions, and manuals are necessary for each of the practical exercises, and these must be kept on a level with scientific progress, and be continually improved or simplified.

With reference to gun practice, a great deal of valuable information is to be found in the regulations published on this subject in 1875, the result of an inquiry by a special commission, as well as in the "Manual of Gunnery" by Colonel Chklarevitch. It is considered useless to expect good results in this practice, unless Officers and gunners have received a sufficient preparatory education both in the theory and practice of their profession.

This education includes, for the gunners, heavy gun drill, use of the sights and range-tables, adjustment and care of the breech mechanism, setting of the time-fuze, and preparation of the percussion-fuze. During the annual course they are taught the effect of the gases from the powder upon the gun and breech mechanism and the effect of the various kinds of projectiles upon troops and cover.

A special body of men are told off for laying the guns, and these have to rapidly execute all the particular details of their duty; they have to learn the use of the quadrant, the manner of adjusting obturators, and in general the means for rectifying errors and obviating causes which prevent the regular action of the breech. During practice they are taught to observe the effect of fire and apply the necessary corrections. The non-commissioned officers in their preparatory course are taught how to direct the firing of a single piece, correct any errors made by men who lay the gun, make proper use of the range-tables, and alter the sights after the observation of each round. During a siege they may be called on to take command of a battery; for this purpose they are given the direction of a few guns at a time, and are taught to select the mode of laying most suitable in a given case, to solve questions relating to the object to be aimed at, the conduct of fire, &c. Officers are expected to know all the duties of their subordinates, and to be able to solve with rapidity and exactness, by means of the manual and range-tables, all questions relating to firing. During practice they are advised to try and perfect themselves in the conduct of fire, the secret of

which consists in knowing how to observe the effect of each round, and apply the necessary corrections.

It is the duty of the engineers to construct all siege batteries, together with their powder magazines, blindages, traverses, &c., as well as to prepare all material needed for the repair of the works.

Very little is therefore required from the fortress gunners, and the larger works of repair are more usually given over to infantry working parties under the guidance of an engineer cadre.

The pyrotechnical studies demanded are not very extensive, and are summarized in the "Practical Manual" issued by the artillery school press. Ever since the reorganization of 1876, the fortress gunners have been trained in elementary musketry as well as with the "rampart gun" of the 1876 pattern up to within a more recent period.

The German foot artillery after the war with France were given rifles, and taught their use by Officers and non-commissioned officers from the infantry, but, after all, the gun is the real arm of artillery, and the Russians are right in only awarding the rifle a secondary place in the training of their fortress troops.

Since the year 1861 a number of artillery polygons or land ranges have existed where fortress troops from the neighbouring strong places take their turn at big gun drill. In the ranges which are the common property of artillery and engineers, parallels, approaches, and batteries are constructed, and projectiles with service charges are fired against these, or experimental sections of escarps of a typical enceinte, and the profit derived from this system is very great.

The war of 1870–71 proved what advantage the Prussians had gained from their experiences of siege war at Neisse in 1865, and at Coblentz in 1868; these and the experiences of the war being followed up by the Graudenz siege manœuvres of 1873 (perhaps the most valuable of all), and those at Coblentz of 1875.

Fortress manœuvres are in one sense more valuable and more indispensable for infantry and artillery belonging to the garrison of a strong place than field manœuvres are for the rest of the army, since in the first case they take place on the very ground where the enemy will have to be encountered in war, and the actual conditions may with care be very closely realized.

One of Colonel v. Löbell's year books remarks on this subject: "The German foot artillery has gained an enormous advantage from the development which has been given in recent years to fortress manœuvres. When each company has executed the preparatory exercises on the ground the battalions are broken up into two parts, one being charged with the attack and another with the defence of the fortress which they aid in garrisoning. These exercises last fourteen days, and aim at giving the troops a practical and precise notion of siege warfare, just as the autumn manœuvres initiate them into field fighting. The expenditure both of money and materials allows these exercises to be given a distinctly practical character, and render them eminently useful for the war training of fortress troops."

Siege manœuvres have taken place at intervals in Russia ever since 1843, when the first was chronicled at Novo-Georgievsk, but these early efforts were somewhat wanting in realistic effect, since the approaches often only consisted of traced works, and the fortress fire of harmless blank charges. Again, the peace effectives of fortress troops were only sufficient for the daily routine of garrison work. But subsequent to the Franco-German War these experiences received a great development and became of real value, as for instance at Bobruisk in 1879, for by this time the reorganization of the fortress artillery permitted larger numbers to take part in the manœuvres. It is unnecessary to give details of these manœuvres, and it may be said generally, that while

faults are certainly committed, they are more often tactical faults due to a misappreciation of the general idea of the manœuvre than faults of training, since most reports agree in commending the energy, coolness, and knowledge displayed by the gunners, even when the sudden armament of a front of defence was ordered on a dark night without previous notice, as at Bobruisk in 1879. In 1884 the Tsar was present at an armament manœuvre at Novo-Georgievsk: forty-nine guns of a total weight of 512 tons had to be placed in battery by five battalions of fortress artillery; in an hour and a quarter from the signal, fire was opened from an 8-inch gun, and the entire armament was complete in two hours. At night some experimental fire was practised on batteries of the attack. The field of fire was lit up by a Mangin electric light with two Siemens engines, objects 2,500 yards distant being quite visible; a siege battery 2,400 yards distant was perfectly visible from the ramparts, and the percentage of hits was very high.

The foregoing description, together with the plates and tables, will enable technical and other readers to form their own conclusions upon the whole service of the Russian artillery. In this paper, which does not profess to be anything more than a compilation from sources within the reach of every one, all criticisms have been omitted except in those instances where they are necessary to enlarge or explain the particular points under discussion. The subject is one that is worth the attention of artillerymen. Very little in the foregoing pages has been gathered from English works, the collection of facts recorded may perhaps be of some value, if the Russian artillery is again called upon to take the field.

To complete the picture it would be necessary to give details concerning the recruiting, transport, and mobilization of the service, but these matters are so closely bound up with larger questions which affect the whole of the army, that to attempt their discussion in this paper would be to lengthen the subject beyond all measure.

Many of the details given are of a somewhat dry nature, but no military organization can be described except by the careful analysis of those details upon which the greater questions rest.

It is quite true that, regarded from an ideal standpoint, the Russian artillery does not bear comparison in some respects with what our advanced school considers indispensable. That the best of the Russian field-guns are inferior to our new 12-prs. is an undeniable fact, but against it may be put the equally true fact, that for the last ten years the Russian artillery has been in possession of guns and equipment superior in many points to our own, and that twice at least within that period we have been within a measurable distance of war.

In artillery matters it is or should be true that all that is last is best, and to suggest that the Russian field material only approaches a standard of respectable mediocrity, because we have just invented and armed a few batteries with a weapon giving some 300 feet a second greater initial velocity than the Russian guns of 1877–79, is to beg the whole question in its larger bearing.

In a certain sense the moment chosen for rearmament was perhaps not a fortunate one for Russia, since a really high velocity gun was soon afterwards produced in France; on the other hand, the material bears comparison with that of Austria and Germany, and it is by this standard, rather than by some fanciful ideal, that one should judge the productions of Russian arsenals. The Russian artillery is a remarkable service from many points of view, but perhaps the most striking feature is the peculiarly comprehensive character of its organization. However much one may criticize certain points—and

what artilleries are not open to criticism?—one cannot say of the Russian artillery that one portion of the service has been nursed and pampered to the exclusion of another. The result is a particularly level organization in which heavy effectives, a respectable armament, and a fair practical training go far to promise a better measure of success in the next great war.

APPENDIX.

I. *Details: Guns and Projectiles.*

Data.	Field artillery.				
	Mountain guns.		Field guns.		
	2·5″ Baranovski.	2·5″ 1883 pattern.	H. A.	Light.	Heavy.
Guns.					
Calibre ..... mm.	63·5	63·5	87	87	106·7
Length — Total ..... m.	1·21	1·01	1·70	2·10	2·10
Length — of bore ..... m.	1·07	0·853	1·465	1·865	1·830
Length ..... cal.	16·8	13·4	16·8	21·4	17·2
Length — of rifled portion ... m.	0·778	0·549	1·067	1·492	1·430
Length — of line of sight .... m.	0·432	0·940	0·735	0·848	0·848
Powder chamber — Length ..... mm.	175	165	195	170	170
Powder chamber — Diameter..... mm.	66	67	98	98	118
Grooves — Number.....	20	20	24	24	24
Grooves — Depth ..... mm.	0·63	1·02	1·24	1·24	1·24
Grooves — Breadth..... mm.	8·13	8·13	8·41	8·41	10·49
Total weight..... kg.	97	98	365	460	625
Weight of breech mechanism. kg.	8·4	..	42	42	60
Preponderance of breech..... kg.	7	25	53	64	61
Projectiles.					
Common shell — Length ..... mm.	225	216	226	226	277
Common shell ..... cal.	3·55	3·4	2·6	2·6	2·6
Common shell — Weight loaded .. kg.	4·150	4·000	6·860	6·860	12·5
Common shell — Bursting charge.. kg.	0·070	0·125	0·218	0·218	0·423
Shrapnel — Length .....mm.	191	192	185	185	236
Shrapnel ..... cal.	3	3	2·1	2·1	2·2
Shrapnel — Weight loaded ... kg.	4·140	4·040	6·860	6·860	12·5
Shrapnel — Bursting charge .. kg.	0·030	0·030	0·060	0·060	0·110
Shrapnel — Number of bullets	88	132	165	165	340
Shrapnel — Weight of each .. g.	10·7	10·7	10·7	10·7	10·7
Case — Weight ..... kg.	..	3·275	6·550	6·550	11·7
Case — Number of bullets	..	96	102	102	171
Case — Weight of each ..... g.	..	25·6	49	49	49

I. *Details: Guns and Projectiles*—continued.

Data.		Siege and fortress guns.								
		Guns.					Howitzers.			
		4·9″.	6″ light.	6″ heavy.	8″ light.	8″ screw.	3·4″.	8″ cast iron.	8″.	9″ screw.
Guns.										
Calibre	mm.	106·7	152·4	152·4	203	203	87	203	203	229
Length — Total	m.	3·73	3·25	3·36	3·40	3·40	0·61	1·83	2·29	2·67
Length — of bore	m.	3·454	2·916	2·896	2·883	2·883	0·495	1·323	1·778	2·083
Length	cal.	32·4	19·1	19·0	14·2	14·2	5·7	6·5	8·8	9·1
Length — of rifled portion	m.	2·784	2·386	2·052	2·219	2·219	0·300	0·771	1·171	1·228
Length — of line of sight	m.	1·328	1·735	1·448	1·448	1·245	..	1·773	1·207	..
Powder chamber — Length	mm.	368	325	639	367	367	65	254	310	523
Powder chamber — Diameter	mm.	127	159	159	211	211	91	211	211	237
Grooves — Number		36	36	36	46	46	24	46	46	52
Grooves — Depth	mm.	1·27	1·27	1·27	1·52	1·52	1·24	1·52	1·52	1·52
Grooves — Breadth	mm.	6·25	8·64	8·64	9·30	9·30	8·41	9·30	9·30	9·25
Total weight	kg.	1,310	1,970	3,090	5,855	5,670	90	3,275	3,275	5,580
Weight of breech mechanism	kg.	..	..	176	300	300	..	300	300	391
Preponderance of breech	kg.	115	98	0	0	0	0	0	0	0
Projectiles.										
Common shell — Length	mm.	361	381	381	508	508	226	508	508	572
Common shell	cal.	3·4	2·5	2·5	2·5	2·5	2·6	2·5	2·5	2·5
Common shell — Weight loaded	kg.	16·3	33·3	33·3	78	78	6·860	78	78	111
Common shell — Bursting charge	kg.	0·610	1·540	1·540	3·5	3·5	0·218	3·5	3·5	5·0
Steel shell — Length	mm.	432	351	351	469	469	..	..	..	..
Steel shell	cal.	4	2·3	2·3	2·3	2·3	..	..	..	..
Steel shell — Weight loaded	kg.	16·3	37·9	37·9	89	89	..	..	..	..
Shrapnel — Length	mm.	282	320	320	..	..	185	..	..	..
Shrapnel	cal.	2·6	2·1	2·1	..	..	2·1	..	..	..
Shrapnel — Weight loaded	kg.	16·7	35·9	35·9	..	..	6·860	..	..	..
Shrapnel — Bursting charge	kg.	0·117	0·205	0·205	..	..	0·060	..	..	..
Shrapnel — Number of bullets		620	518	518	..	..	165	..	..	..
Shrapnel — Weight of each	g.	10·7	21	21	..	..	10·7	..	..	..

I. *Details: Guns and Projectiles*—continued.

Data.	Coast guns.					4·2″ mitrailleuses.	
	Guns.			Howitzers.		10-barrel.	6-barrel.
	9″.	11″.	14″.	9″.	11″.		
GUNS.							
Calibre ..... mm.	229	280	355	229	280	10·7	10·7
Length — Total ..... m.	502	6·10	8·00	2·67	3·26	1·53	1·12
Length — of bore..... m.	4·318	5·265	6·860	2·083	2·545	0·813	0·660
Length ..... cal.	18·9	18·8	19·3	9·1	9·1	76	62
Length — of rifled portion.. m.	3·179	3·653	4·811	1·228	1·476	0·734	0·587
Length — of line of sight .. m.	2·102	2·450	3·370	0·711	1·600	..	..
Powder chamber — Length ..... mm.	812	1,204	1,470	523	660	..	..
Powder chamber — Diameter ..... mm.	237	290	367	237	290	..	..
Grooves — Number	52	64	80	52	64	6	6
Grooves — Depth ..... mm.	1·52	1·78	2·00	1·52	1·78	0·28	0·28
Grooves — Breadth..... mm.	9·25	9·14	9·45	9·25	9·14	3·90	3·90
Total weight..... kg.	15,350	28,700	58,500	5,500	8,790	168	53
Weight of breech mechanism kg.	491	1,057	2,293	377	666	..	..
Preponderance of breech ... kg.	200	0	0	0	0	..	..
PROJECTILES.							
Common shell — Length ..... mm.	572	775	1,001	572	..	..	..
Common shell — ..... cal.	2·5	2·8	2·8	2·5	..	..	..
Common shell — Weight loaded.. kg.	111	217	432	111	..	..	.
Common shell — Bursting charge. kg.	5·0	11·5	21·1	5·0	..	..	..
Cast iron shell — Length ..... mm.	572	784	1,000	572	..	..	..
Cast iron shell — ..... cal.	2·5	2·8	2·8	2·5	..	..	..
Cast iron shell — Weight loaded..... kg.	126	250	518	126	..	..	..
Steel shell — Length ..... mm.	556	721	518	556	..	..	..
Steel shell — ..... cal.	2·4	2·6	..	2·4	..	..	..
Steel shell — Weight loaded..... kg.	126	250	..	126	..	..	..
Shrapnel — Length ..... mm.	126	250	..	126	..	..	..
Shrapnel — Weight loaded.. kg.	..	..	..	..	..	0·039	0·039
Shrapnel — Bursting charge . kg.	..	..	..	..	..	0·005	0·005
Shrapnel — Number of bullets ...	..	..	..	..	..	1	1
Shrapnel — Weight of each.. g.	..	..	..	..	..	24	24

II. *Charges: Penetration, &c.*

	Field guns.					Siege and fortress guns.								Coast guns.			
	Mountain guns.		Field guns.			Guns.					Howitzers.			Guns.			
	2·5″ Baranovski.	2·5″ 1883.	H. A.	Light.	Heavy.	4·2″.	6″ light.	6″ heavy.	8″ light.	8″ screw.	8″ cast iron.	8″.	9″ screw.	9″.	11″.	14″.	9″ mortar.
Gunnery.																	
Maximum charge—																	
Common shell ..... kg.	0·370	0·370	1·400	1·400	1·840	3·280	3·480	8·600	7·780	7·780	4·100	6·140	13·100	26·4	54·5	90	13·110
..... kg.	„	„	„	„	„	„	„	9·000	„	„	„	„	„	29·3	52·4	98	12·700
Proportion between weight of charge and of projectile	1 / 11·2	1 / 10·9	1 / 4·9	1 / 4·9	1 / 6·7	1 / 5	1 / 9·6	1 / 4	1 / 10	1 / 10	1 / 19·1	1 / 12·7	1 / 8·4	1 / 4·2	1 / 3·9	1 / 4·8	1 / 8·4
Extreme range on tables m.	3,200	..	6,400	6,400	5,340	8,750	7,250	8,970	7,040	704	3,910	5,710	7,420	7,470	8,540	7,470	7,420
Initial velocity—																	
Common shell ..... m.	290	284	411	442	373	426	332	458	321	321	214	272	315	457	457	396	316
..... m.	„	„	„	„	„	„	„	446	303	303	„	„	„	„	427	„	290
Penetration into earth—																	
At 1,050 m. ..... m.	1·43	1·37	1·71	1·82	1·83	2·93	2·35	2·96	3·14	3·14	..	1·60	2·20	..	..	..	2·20
At 2,100 m. ..... m.	1·28	1·22	1·43	1·49	1·52	2·44	2·10	2·51	2·90	2·90	1·60	2·26	2·96	..	..	..	2·96
Penetration into iron—																	
Point blank .....mm.	..	..	..	..	..	..	..	206	180	180	..	..	..	325	386	462	..
At 1,050 m. .....mm.	..	..	..	..	..	..	..	160	165	165	..	..	..	285	351	425	..
At 2,100 m. .....mm.	..	..	..	..	..	..	..	137	152	152	..	..	..	254	323	396	160

III. *Carriages.*

		Mountain carriages.		Field carriages.			Siege and fortress carriages.						
										Howitzers.			
		2·5″ Creil system.	2·5″ modified Criel system.	H. A.	Light.	Heavy.	1877 pattern for 4·2″ and 6″ light.	1877 pattern for 6″ heavy.	Nasvietevitch for 6″ heavy.	3·4″.	Old 8″.	8″ light and screw.	9″ 1876 pattern.
Height of axis of the trunnions	m.	0·643	0·690	1·151	1·151	1·103	1·829	1·829	1·245	0·305	1·321	1·521	1·524
Length of the carriage	m.	2·40	2·17	2·69	2·69	2·90	3·34	3·35	2·16	0·66	2·44	2·75	2·75
Diameter of wheels	cm.	88	104	139·5	139·5	139·5	147	147	76	..	30·5	30·5	30·5
Weight without wheels	kg.	140	152	303	356	430	943	1,303	865	90	2,130	2,440	2,457
Weight of the two wheels	kg.	52	63	147	147	147	291	291	249	..	..	..	..
Extreme angles Of depression	−	12	15	10	10	3	6	8	6	10	5	5	5
Extreme angles Of elevation	+	25	30	17 o 18	17 to 18	20	40	40	25	65	75	75	65

NOTE.—All field, siege, and fortress carriages have the double screw, except the modified Creil, which has a lateral screw, and the howitzer carriages, which have single or double toothed arcs.

IV. *Coast and Mitrailleuse Carriages.*

	Coast carriages.						Mitrailleuse carriages.		
	9″ Semenov.	11″ Krupp, No. 1.	11″ Krupp, No. 2.	14″.	Howitzers.		10-barrel.	6-barrel.	Modified Baranovski.
					9″ 1877 pattern.	11″.			
Height of axis of trunnions ..... m.	1·120	1·260	1·385	1·520	1·111	1·385	0·829	0·980	0·617
Length of carriage ..... m.	2·17	2·53	2·90	4·00	2·01	2·94	2·17	2·38	1·75
Diameter of wheels .... cm.	..	..	..	..	..	..	124	135	91
Elevating arrangement	double screw	2 toothed arcs	..	2 toothed arcs	2 toothed arcs	..	plain screw	plain screw	plain screw
Weight without wheels.. kg.	2,115	..	4,603	..	2,023	about 7,400	176	287	111
Weight of two wheels .. kg.	..	..	..	..	..	..	107	137	33
Extreme angles — Of depression	2	6	6	6	5	7	..	..	..
Extreme angles + Of elevation .	17	20	24	19	65	65	..	..	..

V. *Ranges, Rectangles, &c.: Field Guns.*

Guns.	Range.	Angle of fire.	Angle of fall.	Remaining velocity.	Time of flight.	Probable rectangles.		
						Length.	Breadth.	Height.
	m.	° ′	° ′	m.	sec.	m.	m.	m.
H. A. Gun.	500	0 40	1 10	350	1·3	8	0·1	0·2
	1,000	1 40	2 40	312	2·9	8	0·4	0·4
Weight of projectile 6·860 kg.	2,000	4 25	6 35	267	6·3	11	1·1	1·3
Weight of charge 1·400 kg.	3,000	8 10	11 30	234	10·4	16	2·5	3·1
Initial velocity 411 m.	4,000	12 40	17 45	208	15·0	21	4·7	6·7
	5,000	17 55	25 25	188	20·4	27	8·7	13·2
	6,000	23 25	34 35	176	26·6	34	16·4	24·1
Light Gun.	500	0 25	0 40	374	1·2	8	0·1	0·1
	1,000	1 20	1 45	315	2·7	9	0·2	0·2
Weight of projectile 6·860 kg.	2,000	4 00	4 50	275	6·1	11	0·6	1·0
Weight of charge 1·400 kg.	3,000	7 30	9 40	240	10·0	13	1·5	2·2
Initial velocity 442 m.	4,000	11 25	15 40	212	14·5	16	2·4	4·6
	5,000	15 40	23 15	192	19·8	22	3·4	10·8
	6,000	20 20	32 05	178	25·9	29	4·4	19 3
Heavy Gun.	500	1 05	1 10	332	1·3	7	0·1	0·1
	1,000	2 20	2 40	304	2·9	7	0 2	0·3
Weight of projectile 12·490 kg.	2,000	5 35	6 50	266	6·6	10	0·8	1·2
Weight of charge 1·840 kg.	3,000	9 50	13 15	240	10·6	16	1·9	4 0
Initial velocity 373 m.	4,000	15 35	22 00	216	15·0	26	3·4	10·0
	5,000	22 55	33 10	196	20·6	..	..	..

VI. *Ranges and Rectangles: Heavy Guns.*

VI. *Ranges and Rectangles: Heavy Guns.*

Guns	Range.	Angle of fire.	Angle of fall.	Remaining velocity.	Time of flight.	Probable rectangles.		
						Length.	Breadth.	Height.
	m.	° ′	° ′	m.	sec.	m.	m.	m.
4·2″ *Gun.*	500	0 40	0 55	385	1·2	7	0·1	0·1
	1,000	1 35	2 00	352	2·6	7	0·2	0·2
Projectile 16·280 kg.	2,000	3 55	5 00	311	5·6	7	0·4	0·6
Charge 3·280 kg.	3,000	6 40	8 45	281	9·2	8	0·8	1·2
Initial velocity 426 m.	4,000	9 50	13 20	263	12·9	10	1·4	2·2
	5,000	13 35	18 55	249	17·1	13	2·2	4·5
	6,000	18 05	25 40	237	22·0	19	3·1	9·0
6″ *Light Gun.*	500	1 15	1 20	311	1·5	4	0·1	0·1
	1,000	2 45	3 00	295	3·2	5	0·3	0·2
Projectile 33·270 kg.	2,000	5 55	6 45	270	6·9	6	0·7	0·6
Charge 3·480 kg.	3,000	9 40	11 30	252	10·7	8	1·2	1·4
Initial velocity 332 m.	4,000	13 55	17 05	243	14·9	10	1·9	3·0
	5,000	18 40	23 25	237	19·2	15	2·7	5·6
	6,000	24 05	30 00	233	24·7	24	3·7	13·7
6″ *Heavy Gun.*	500	0 45	0 50	414	1·2	6	0·1	0·1
	1,000	1 35	1 45	373	2·4	7	0·1	0·3
Projectile 33·270 kg.	2,000	3 35	4 35	320	5·3	9	0·4	0·9
Charge 8·600 kg.	3,000	6 05	8 20	288	8·8	12	0·8	1·9
Initial velocity 458 m.	4,000	9 05	12 45	270	12·5	14	1·4	3·2
	5,000	12 30	17 45	260	16·5	16	2·3	5·0
	6,000	16 25	23 35	253	20·8	19	3·3	7·6
8″ *Gun.*	500	1 25	1 30	307	1·6	5	0·1	0·1
	1,000	2 55	3 05	301	3·3	7	0·3	0·4
Projectile 78 kg.	2,000	6 10	6 40	282	6·7	9	0·6	1·1
Charge 7·780 kg.	3,000	9 45	11 05	266	10·5	12	1·0	2·4
Initial velocity 321 m.	4,000	13 45	16 15	254	14·7	16	1·1	4·6
	5,000	18 30	22 30	244	19·4	20	1·9	8·1
	6,000	24 25	30 10	237	24·9	24	2·4	14·1

VI. *Ranges and Rectangles: Heavy Guns*—continued.

Guns.	Range.	Angle of fire.	Angle of fall.	Remaining velocity.	Time of flight.	Probable rectangles.		
						Length.	Breadth.	Height.
	m.	° ′	° ′	m.	sec.	m.	m.	m.
9″ *Gun.*	500	0 40	0 45	425	1·2	6	0·1	0·1
	1,000	1 30	1 35	398	2·3	7	0·1	0·2
Projectile 111 kg.	2,000	3 15	3 50	353	4·9	9	0·3	0·6
Charge 26·410 kg.	3,000	5 25	6 50	323	8·0	11	0·7	1·3
Initial velocity 457 m.	4,000	7 55	10 25	303	11·3	14	1·3	2·5
	5,000	10 45	14 25	287	14·9	16	2·0	4·1
	6,000	14 00	19 05	275	18·8	19	2·9	6·6
11″ *Gun.*	500	0 40	0 45	435	1·2	4	0·1	0·1
	1,000	1 25	1 35	411	2·3	4	0·1	0·1
Projectile 217 kg.	2,000	3 05	3 40	374	4·8	4	0·2	0·3
Charge 54·470 kg.	3,000	5 05	6 10	343	7·6	5	0·4	0·5
Initial velocity 457 m.	4,000	7 15	9 15	321	10·8	6	0·6	0·9
	5,000	9 45	12 40	308	14·1	8	0·9	1·7
	6,000	12 35	16 40	297	17·7	11	1·3	3·3
14″ *Gun.*	500	0 55	1 00	382	1·2	..	..	..
	1,000	1 05	2 00	369	2·6	..	..	..
Projectile 432 kg.	2,000	4 00	4 25	345	5·4	..	..	..
Charge 90 kg.	3,000	6 20	7 15	327	8·5	..	..	..
Initial velocity 396 m.	4,000	8 55	10 25	312	11·7	..	..	..
	5,000	11 45	14 00	302	15·2	..	..	..
	6,000	14 55	18 00	294	19·0	..	..	..

VII. *Details of Fire.* 8″ *Steel Howitzer,* 1877 *Pattern.*

Charges.	Initial velocities.	Ranges.	Angles of fire.	Angles of fall.	Remaining velocity.	Time of flight.	Probable rectangles.	
							Length.	Breadth.
kg.	m.	m.	° ′	° ′	m.	sec.	m.	m.
6·140	272	4,100	20 30	23 40	220	18	12	3
		5,000	29 00	34 00	218	25	16	4
		5,700	43 00	49 20	217	35	20	6
		5,700	44 15	50 30	217	35	20	6
		5,000	58 45	64 10	225	43	19	8
		4,200	65 15	70 10	231	46	17	10
5·300	250	3,600	20 45	23 20	210	17	11	3
		4,000	24 30	27 50	208	20	13	3
		4,900	38 00	43 00	206	29	18	4
		4,900	50 00	55 30	207	36	19	6
		4,000	62 30	67 10	215	42	18	8
		3,700	64 45	69 10	218	43	17	9
3·700	200	2,500	21 00	22 40	182	14	9	2
		3,000	27 45	30 20	178	18	13	2
		3,500	41 30	45 00	175	26	17	3
		3,500	46 30	50 20	175	29	17	3
		3,000	60 30	64 10	180	34	15	5
		2,600	64 45	68 10	183	35	14	6
2·200	150	1,400	20 30	21 40	138	11	7	1
		2,000	37 30	39 40	134	18	14	1
		2,000	51 30	54 00	135	23	14	2
		1,500	65 45	68 00	140	27	11	3
1·200	100	600	21 45	22 10	98	8	6	0·3
		1,000	43 00	43 30	96	14	13	0·6
		1,000	44 00	44 30	96	14	13	0·6
		800	63 00	63 40	98	18	9	1·3

VIII. *Details of Fire. 9″ Howitzer, 1877 Pattern.*

Charge.	Initial velocities.	Ranges.	Angles of fire.	Angles of fall.	Remaining velocities.	Time of flight.	Probable rectangles.	
							Length.	Breadth.
kg.	m.	m.	° ′	° ′	m.	m.	m.	m.
13·100	315	7,400	44 30	51 00	242	41	35	8
		7,000	53 00	58 10	250	46	31	9
		6,000	61 15	66 00	253	51	24	13
		5,400	64 45	69 40	255	53	21	15
12·100	300	6,800	48 00	53 20	239	41	32	8
		6,000	58 00	62 30	245	47	26	11
		5,000	65 00	69 00	248	52	20	14
9·300	250	5,100	49 00	52 50	212	36	26	6
		5,000	52 00	55 30	214	38	24	7
		4,000	63 30	66 50	216	44	17	11
		3,900	64 00	67 20	216	45	16	11
6·350	200	3,600	47 30	50 10	178	29	21	5
		3,000	60 45	63 10	182	35	15	8
		2,600	64 30	66 50	183	36	12	10
3·900	150	2,100	48 45	50 20	135	22	14	3
		2,000	52 30	54 00	135	23	13	3
		1,500	65 30	67 10	136	27	8	6
2·000	100	900	54 00	54 50	95	17	8	2
		800	62 00	63 00	96	19	7	3

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FIELD GUNS.

Pl. A.

FIG. 1.—LIGHT GUN. 1877 PATTERN.

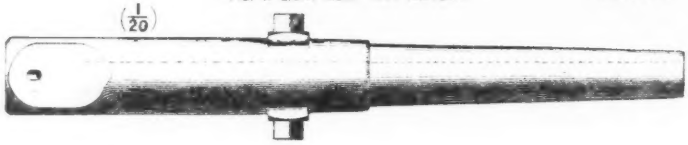


FIG. 2.—LIGHT GUN. 1879 PATTERN.

FIG. 3.—BATTERY GUN. 1877 PATTERN.

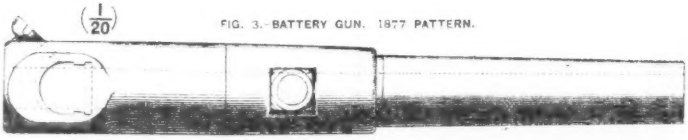


FIG. 4.—1877 PATTERN.

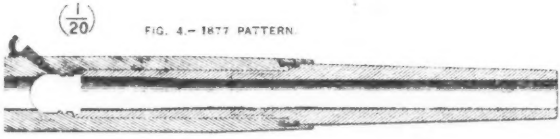


FIG. 5.—1879 PATTERN.

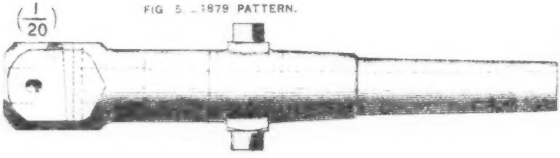
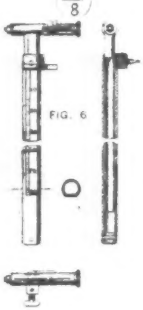


FIG. 6



BREECH CLOSING MECHANISM, LI

FIG. 7.

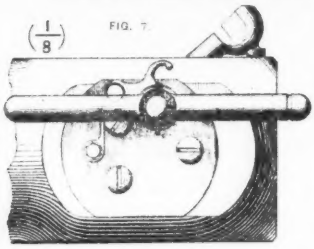


FIG. 9.

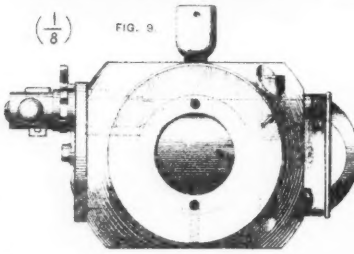
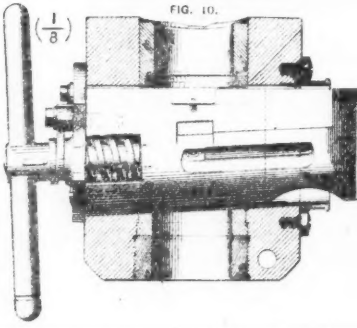
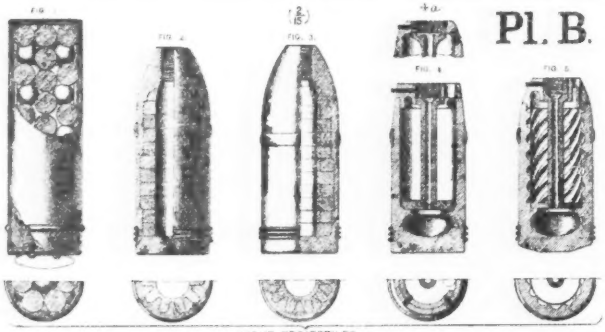


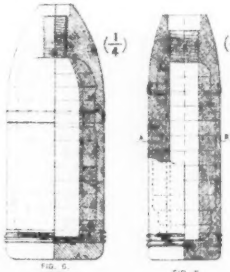
FIG. 10.



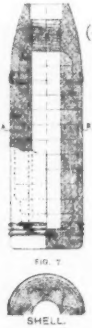
Pl. B.



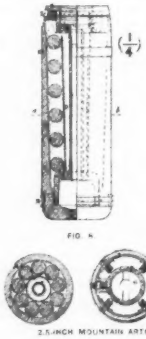
LIGHT PROJECTILES.



HEAVY FIELD SHELL.



SHELL.



2.5-INCH MOUNTAIN ARTILLERY.

MECHANISM, LIGHT GUN 1879 PATTERN.

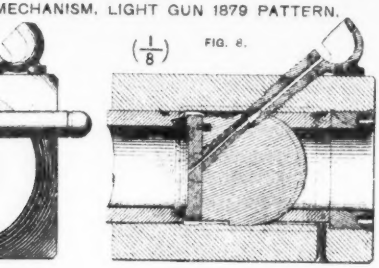
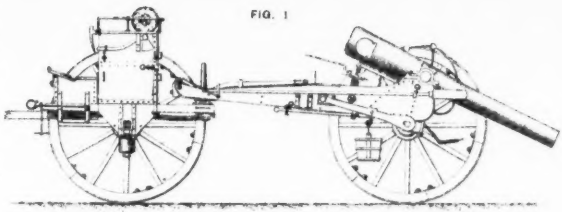


FIG. 8.

THE ENGELHARDT GUN

FIG. 1

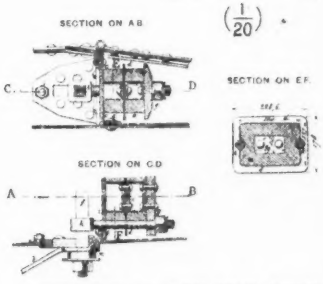


SIDE ELEVATION. GUN LIMBERED UP.

FIG. 3.

Pl.D.

FIG. 2.



ARRANGEMENT OF GUTTA PERCHA SPRINGS.

TYPES OF FUZES.

Pl.C.

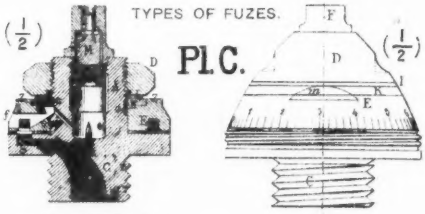
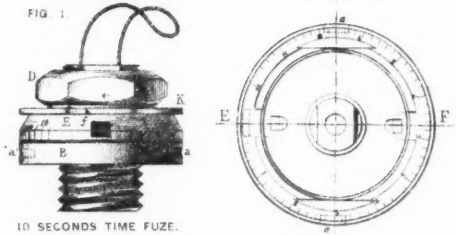


FIG. 1.



10 SECONDS TIME FUZE.

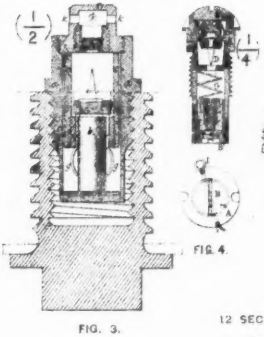


FIG. 3.

BASE FUZE.

FIG. 4.

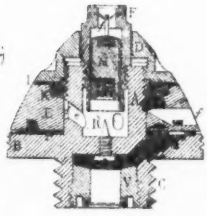


FIG. 2.

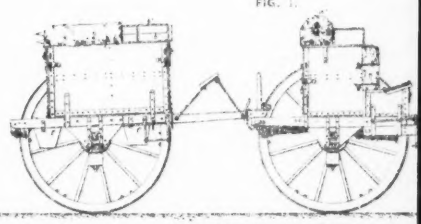
SECTION ON E F

12 SECONDS TIME FUZE. 1884 PATTERN

FIG. 4. PERCUSSION FUZE. 1884 PATTERN.

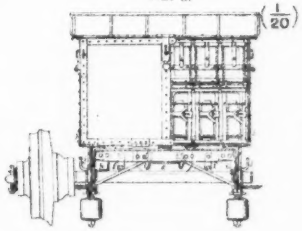
THE ENG

FIG. 1.



AMMUNITION WAGON LIMBERED UP.

FIG. 2.



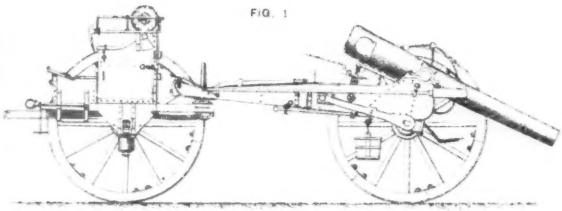
FIG

POLE C

MOUNTAIN ARTILLERY.

THE ENGELHARDT GUN CARRIAGE AND LIMBER.

FIG. 1



SIDE ELEVATION. GUN LIMBERED UP.

FIG. 3. $(\frac{1}{20})$

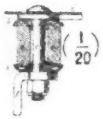
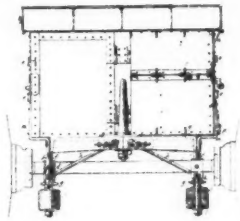


FIG. 5. $(\frac{1}{40})$

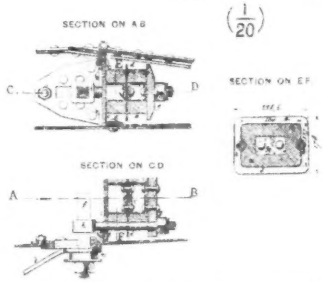


Pl.D.

FIG. 4. $(\frac{1}{20})$

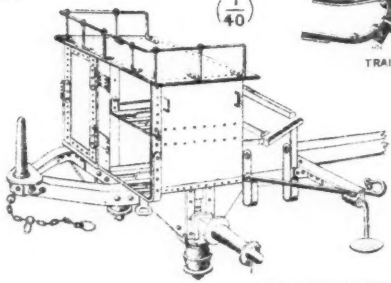
TRAIL END

FIG. 2. $(\frac{1}{20})$



ARRANGEMENT OF GUTTA PERCHA SPRINGS.

FIG. 7. $(\frac{1}{40})$

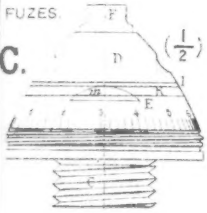


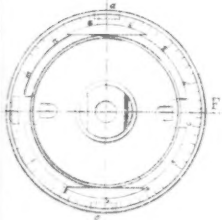
LIMBER FRAMEWORK AND AMMUNITION

FUZES.

C.

$(\frac{1}{2})$





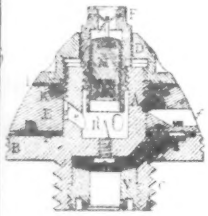


FIG. 2.

SECTION ON EF

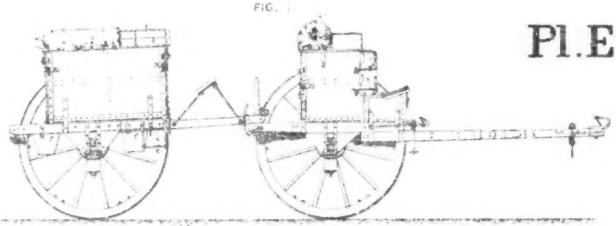
CONDS TIME FUZE. 1884 PATTERN

1164 PERCUSSION FUZE.
1884 PATTERN.

THE ENGELHARDT AMMUNITION WAGON AND LIMBER.

Pl.E.

FIG. 1.



AMMUNITION WAGON LIMBERED UP.

FIG. 3.

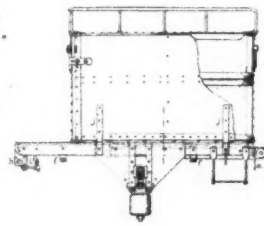


FIG. 2. $(\frac{1}{20})$

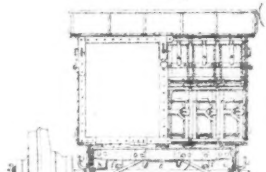
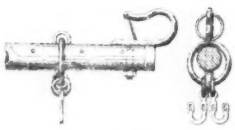
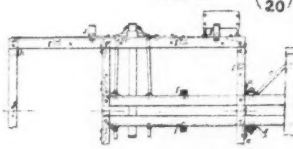


FIG. 4. $(\frac{1}{20})$



POLE COUPLINGS.

FIG. 5.. $(\frac{1}{20})$



FRAMEWORK AND AMMUNITION B

TYPES OF GUNS OF THE RUSSIAN SIEGE TRAIN.

Pl.F.

FIG. 1.—4.2-INCH R.B.L. GUN. SCALE $\frac{1}{40}$

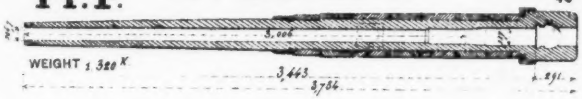


FIG. 2.—6-INCH LONG STEEL HOOPED GUN. PATTERN 1877.

FIG. 3.—8-INCH SCREW R.B.L. GUN.

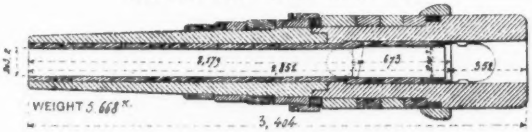


FIG. 4.—8-INCH R.B.L. HOWITZER. PATTERN 1877.

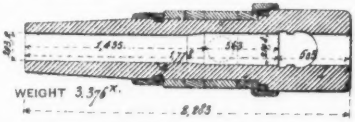
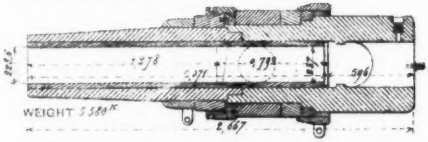


FIG. 5.—9-INCH SCREW R.B.L. HOWITZER.



NOTE.—MEASUREMENTS IN MILLIMETRES. 1 MILLIMETRE = 0·0394 INCH
WEIGHTS IN KILOGRAMMES. 1 KILOGRAMME = 2·2046 LBS. AVP.

FIG. 6 ($\frac{1}{40}$)

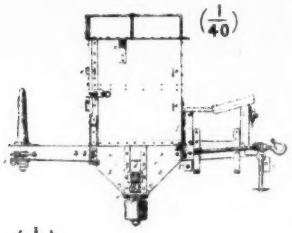
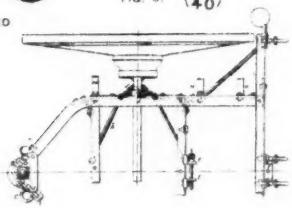


FIG. 4. ($\frac{1}{20}$)

AIL END

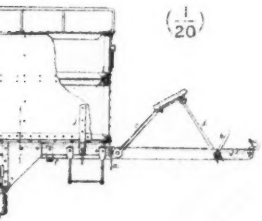
FIG. 8. ($\frac{1}{40}$)



K AND AMMUNITION BOX.

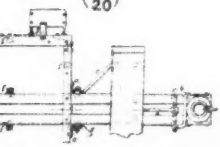
MBER.

FIG. 3.



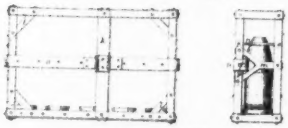
($\frac{1}{20}$)

IG. 5.. ($\frac{1}{20}$)



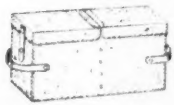
ND AMMUNITION BOX.

FIG. 6. ($\frac{1}{20}$)



PROJECTILE CASE.

FIG. 7.

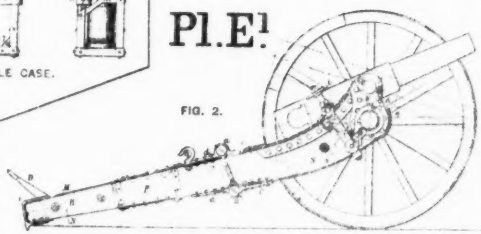


CARTRIDGE CASE.

FIG. 1

Pl.E[1]

FIG. 2.



MOUNTAIN GUNS, PATTERN 1883.

TYPES OF GUNS . RUSSIAN FORTRESS ARTILLERY.

NOTE.—MEASUREMENTS IN MILLIMETRES: 1 MILLIMETRE = 0·0394 INCH
WEIGHTS IN KILOGRAMMES: 1 KILOGRAMME = 2·2046 ADP.

FIG. 1.—24-PR. LONG BRONZE R.B.L. GUN. PATTERN 1867.

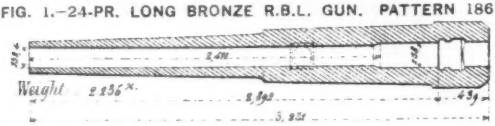
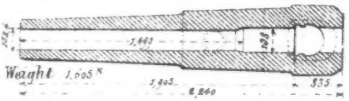


FIG. 2.—24-PR. SHORT CAST IRON R.B.L. GUN. PATTERN 1871.

Pl. G.



SCALE $\frac{1}{40}$

FIG. 3.—24-PR. SHORT STEEL HOOPED R.B.L. GUN.

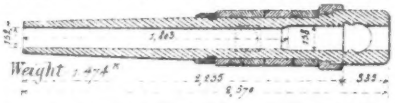
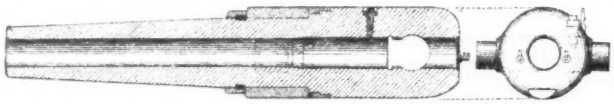


FIG. 4.—8-INCH LIGHT R.B.L. FORTRESS GUN.



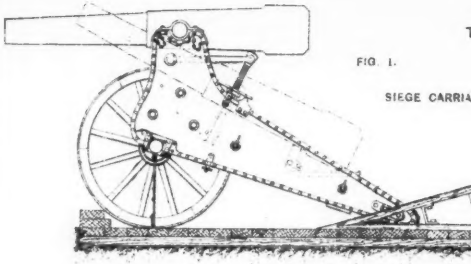


FIG. 1.

SIEGE CARRIA

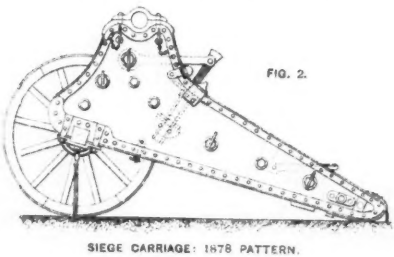


FIG. 2.

SIEGE CARRIAGE: 1878 PATTERN.

TYPES OF GUNS IN RUSSIAN COAST BATTERIES.

Pl H.

FIG. 1

8-INCH CAST IRON HOOPED R.B.L. GUN WITH CYLINDRO PRISMATIC WEDGE.

FIG. 2.

8-INCH STEEL HOOPED R.B.L. GUN WITH SCREW BREECH MECHANISM.

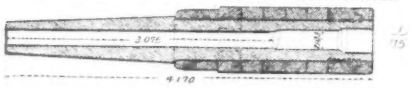


FIG. 3.

16-TON 9-INCH STEEL HOOPED R.B.L. HOWITZER WITH SCREW BREECH MECHANISM.

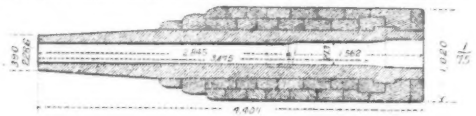


FIG. 4.

43-TON 11-INCH R.B.L. STEEL HOOPED GUN

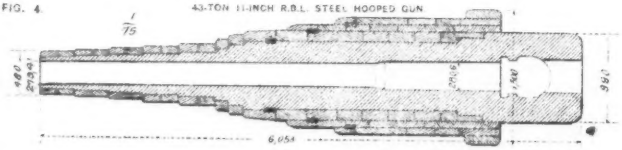


FIG. 6.

8-INCH R.B.L. COAST GUN.

FIG. 7.

8-INCH R.B.L. GUN.

FIG. 8

9-INCH R.B.L. HOOPED COAST GUN.

FIG. 9.

11-INCH R.B.L. HOOPED COAST GUN.

FIG. 5.

9-TON. 9-INCH STEEL HOWITZER.

NOTE. MEASUREMENTS IN MILLIMETRES
1 MILLIMETRE = 0·0394 INCH.

TYPES OF CARRIAGES: HEAVY GUNS AND HOWITZERS.

Pl.I.

FIG. 1.

SIEGE CARRIAGE: 1877 PATTERN.

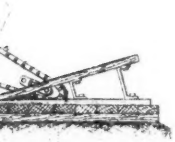
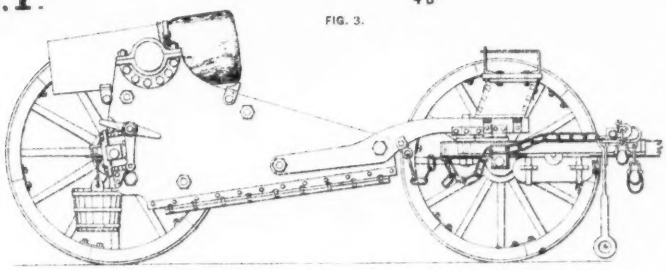
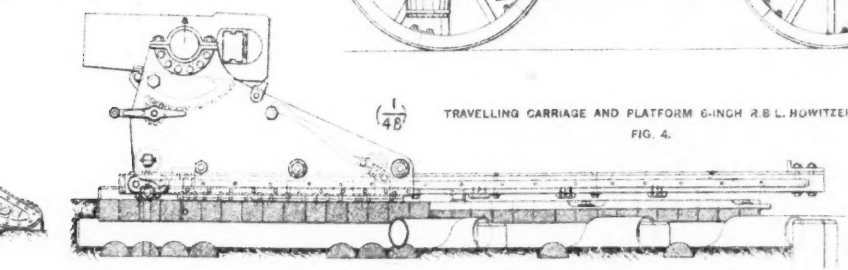


FIG. 3. $(\frac{1}{48})$





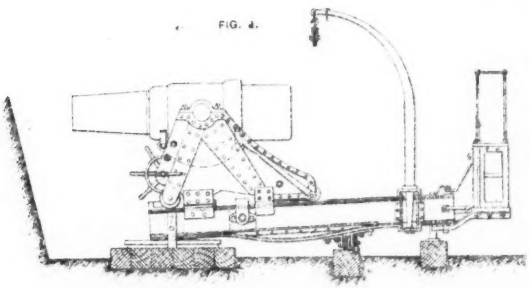
$(\frac{1}{48})$ TRAVELLING CARRIAGE AND PLATFORM 6-INCH R.B.L. HOWITZER.

FIG. 4.

SEM

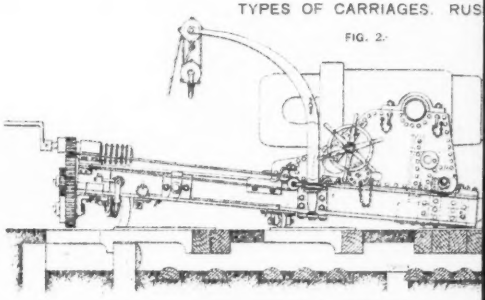
TYPES OF CARRIAGES. RUS

FIG. 4.



9-INCH COAST HOWITZER CARRIAGE.

FIG. 2.



11-INCH COAST GUN

HEAVY PROJECTILES. OLD TYPES.

Pl.M

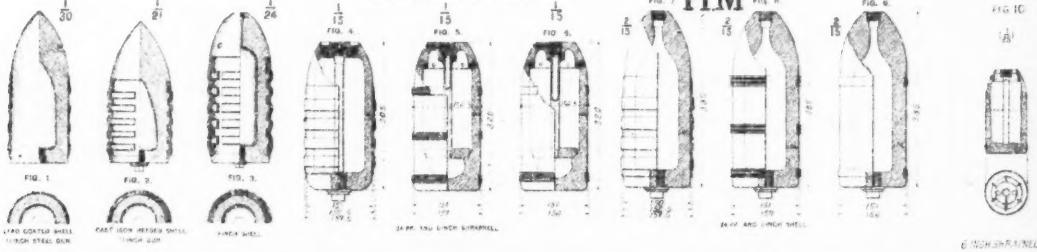


FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5. FIG. 6. FIG. 7. FIG. 8. FIG. 9. FIG. 10.

LEAD COATED SHELL 11-INCH STEEL GUN

CAST IRON CHILLED SHELL 11-INCH GUN

11-INCH SHELL

12-PR. AND 6-INCH SHRAPNELL

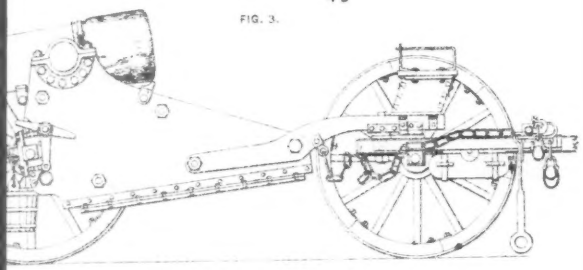
12-PR. AND 6-INCH SHELL

6-INCH SHRAPNELL

AND HOWITZERS.

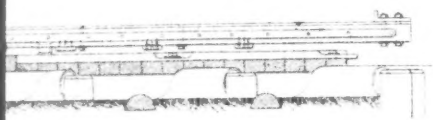
$(\frac{1}{48})$

FIG. 3.



TRAVELLING CARRIAGE AND PLATFORM 6-INCH R.B.L. HOWITZER.

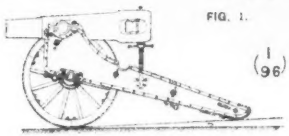
FIG. 4.



TYPES OF CARRIAGES.

FIG. 1.

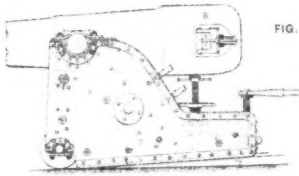
Pl. I[1]



$(\frac{1}{96})$

24 PR. SIEGE CARRIAGE.

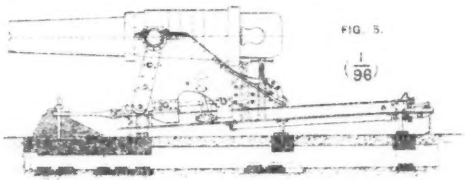
FIG. 2.



$(\frac{1}{64})$

GORLOV CARRIAGE 8 INCH GUNS.

FIG. 5.



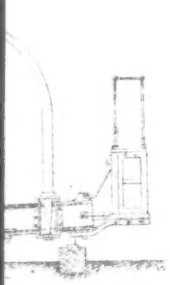
$(\frac{1}{96})$

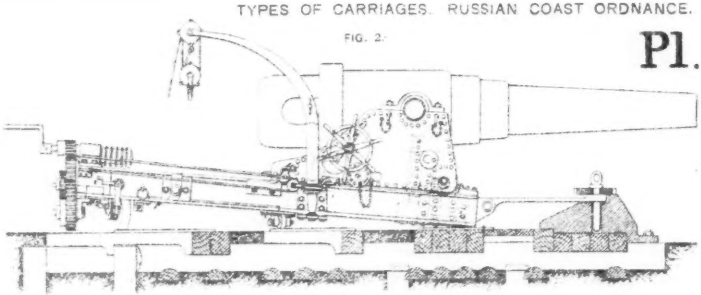
SEMENOV CARRIAGE. 8 INCH GUNS.

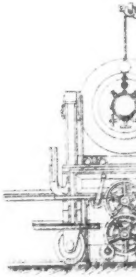
TYPES OF CARRIAGES. RUSSIAN COAST ORDNANCE.

FIG. 2.

Pl. L.



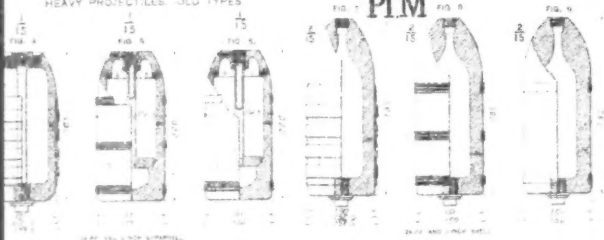




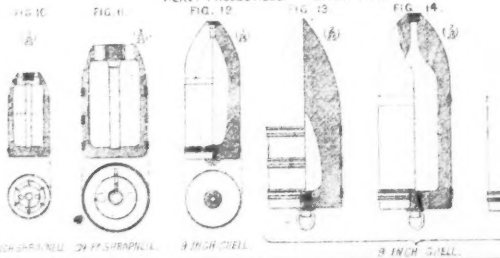
11-INCH COAST GUN

Pl M

HEAVY PROJECTILES. OLD TYPES.



HEAVY PROJECTILES. LATER TYPES.

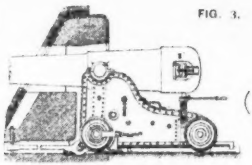


8 INCH SHRAPNELL. 24 PR SHRAPNELL. 8 INCH SHELL. 8 INCH SHELL.

F CARRIAGES.

Pl. I¹

FIG. 3.

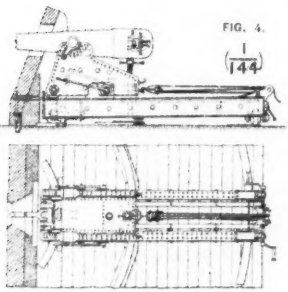


$(\frac{1}{120})$

CHVEDE CARRIAGE 8 INCH GUNS.

FIG. 4.

$(\frac{1}{144})$



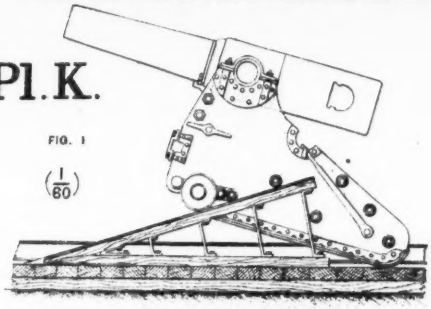
CHANTZ CARRIAGE. 8 INCH GUNS.

TYPES OF CARRIAGES: HEAVY GUNS AND MORTARS.

Pl. K.

FIG. 1

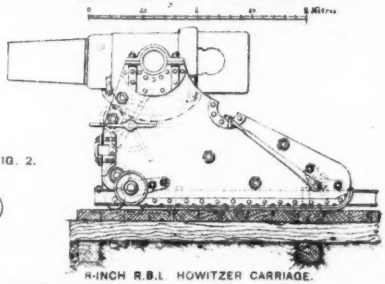
$(\frac{1}{80})$



LIGHT 8-INCH R.B.L. GUN CARRIAGE.

FIG. 2.

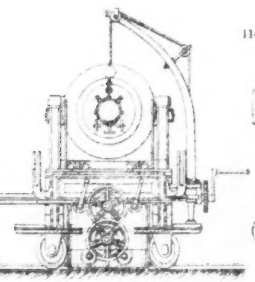
$(\frac{1}{60})$



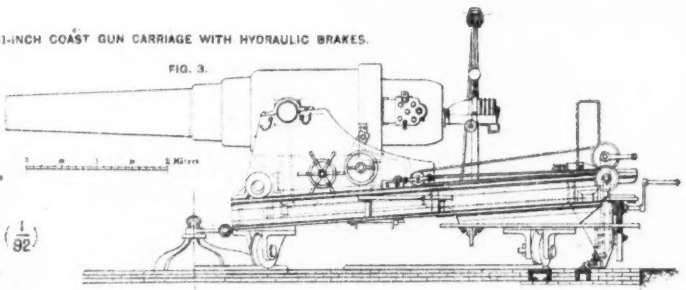
8-INCH R.B.L. HOWITZER CARRIAGE.

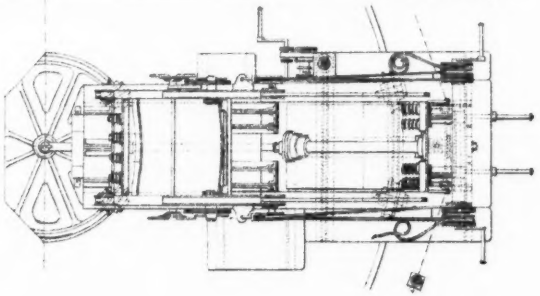
11-INCH COAST GUN CARRIAGE WITH HYDRAULIC BRAKES.

FIG. 3.



$(\frac{1}{92})$





INCH SHELL

NOTICES OF BOOKS.

A Story of Active Service in Foreign Lands. By Surgeon-General A. Graham Young. Edinburgh and London: Blackwood, 1888. Pp. 331. Size 7¾″ × 5¼″ × 1½″. Weight under 1½ lbs. Price 7*s.* 6*d.*

A pleasantly written book, the personal experiences of the author of the expedition to China in 1860 being the most interesting part of it.

The Balance of Military Power in Europe. By Colonel Maurice. Edinburgh and London: Blackwood, 1888. Pp. 240. Size 7½″ × 5½″ × 1¼″. Weight under 1¼ lbs. Price 6*s.*

This volume is a reprint, with additions, of the articles which appeared in "Blackwood's Magazine." As is evident from the introduction, the weight to be attached to the views put forward by Colonel Maurice is very great, owing to the opportunities he has had for mastering the subject.

The British Army, its Regimental Records, Badges, and Devices. By Major J. H. Lawrence-Archer. London: George Bell, 1888. Pp. 623. Size 9¼″ × 7″ × 2¾″. Weight under 3 lbs. Price 31*s.* 6*d.*

The object of this work is to supply in a convenient form an epitome of the regimental records of the British Army; its compilation, considering that it deals with every regiment and corps in the Service, must have involved a great amount of labour, with, however, the result of producing a book which ought to be, assuming the details to be correct—and we have no reason to suppose them otherwise—in every regimental library and mess, and library of reference.—L. A. H.

The Naval Year Book, 1887. Edited by Rear-Admiral Colomb. London: Clowes, 1888. Pp. 212. Size 6½″ × 4¼″ × ½″. Weight under 8 ozs. Price 2*s.*

Admiral Colomb's editorship is sufficient to commend this little work to all interested in the Navy. It is a directory of the naval history of the year 1887. The contents are preceded by a sketch of the naval history of the year, and being arranged under alphabetical heads, can easily be referred to. The book is a first attempt, and will doubtless be greatly expanded as experience is gained.

The Battle of Tofrek. By William Galloway. London: Allen, 1887. Pp. 399. Size 10″ × 8″ × 1¼″. Weight under 3¼ lbs. Price 21*s.*

Mr. Galloway is a Corresponding Member of the Society of Antiquaries of Scotland, and his purpose in this volume is apparently to give an accurate account of Sir J. MacNeill's battle of the 22nd March, 1885, to correct misrepresentations, and to prove the ability of that distinguished Officer. The book, whether as regards type, illustrations, &c., is most elaborately got up, and the author has gone into the minutest details of the subject. We commend its perusal to those interested in the Egyptian Campaigns.—L. A. H.

The Coming of the Great Queen: a Narrative of the Acquisition of Burma. By Major E. C. Browne, Royal Scots Fusiliers. London: Harrison, 1888. Pp. 451. Size 8¾″ × 6″ × 1½″. Weight under 1¾ lbs. Price 12*s.* 6*d.*

This very interesting book came into our hands too late for an earlier notice. It is full of information, and well worth reading.

The Further Training and Employment of Mounted Infantry. By Colonel H. H. PARR. London: Kegan Paul, 1888. Pp. 47. Weight under 6 ozs. Price 1*s.*

Colonel Parr, who was in command of an experimental corps in South Africa in 1880–81, in these pages supplements the official text-book in which is embodied his system of instruction. He deals in successive chapters with the employment and duties of mounted infantry, training and instruction, exercises and manœuvres, saddlery and equipment, employment of machine-guns with mounted infantry, mounted infantry in an advance guard action.

Letters of General C. G. Gordon to his Sister M. A. Gordon. London: Macmillan, 1888. Pp. 404. Size 7½″ × 5″ × 1¼″. Weight under 1 lb. 6 ozs. Price 7*s.* 6*d.*

These letters give the religious views of Gordon, and are of the deepest interest.

Messrs. Gale and Polden send the undermentioned works:—

Soldiers' Shooting. By Lieut. Hovell. Price 1*s.* 6*d.* *Rhymes from the Ranks.* By Quartermaster-Sergeant MOREY. 1*s.* *Notes on Army Signalling.* By Captain BOWER. 1*s.* *Guide to Obtaining Civil Employment.* 6*d.* *Badges and Honours of the British Army.* In four packets, 6*d.* each.

The Naval Annual, 1881. By Lord BRASSEY. Portsmouth: Griffin. London Agents: Simpkin, Marshall. Second year of publication. Pp. 753. Size 10″ × 6½″ × 2¼″. Weight under 4 lbs. 8 ozs. Price 7*s.* 6*d.*

The first section of the valuable work, "Recent Naval Administration," is from the pen of Lord Brassey; the second, "British and Foreign Armoured and Unarmoured Ships," is by Mr. F. K. Barnes; the third, "Armour and Ordnance," by Captain Orde Browne; the fourth, "Torpedoes," by Lieut. Sleeman. The work is admirably got up.

The Fighting Veres. By CLEMENTS R. MARKHAM. London: Sampson Low, 1888. Pp. 471. Size 9¼″ × 6″ × 1¾″. Weight under 3 lbs. 2 ozs. Price 18*s.*

Mr. Markham will forgive us if we own that we were completely misled by the title of his book. He is so closely associated in the minds of most of us with geographical research, that not a few, on reading this title, must have believed the book bearing it to be an account of some hitherto unknown wild tribe of barbaric warriors. "The Fighting Veres" of Mr. Markham are, however, the two brothers Sir Francis and Sir Horace Vere, of whom the first-named is, in Mr. Markham's estimation, the first great General in modern history, and who founded a school of military art which was further developed by his brother. It was in the War of Independence in the Netherlands that their natural military abilities found scope for exercise; and the history of their lives is the military history of England during half a century. Of that military history Mr. Markham has given us ample details of all kinds.

Incwadi Yami; or Twenty Years' Personal Experience in South Africa. By J. W. MATTHEWS. London: Sampson Low, 1887. Pp. 542. Size 9½″ × 6½″ × 1½″. Weight under 2 lbs. 10 ozs. Price 14*s.*

This book ought to find a very large number of appreciative readers, whether they wish to learn anything about the Diamond Fields, Zululand, the war with Cetewayo, the Boer War, Natal, or South Africa generally. Mr. Matthews has held high office in the Legislature of South Africa, but writes temperately on the politics of that country. The information he obtained with regard to the details of General Colley's ill-fated campaign are sad reading enough. One short extract for military men. Writing of Bronkhirst Sprut, Mr. Matthews says: "Such was the precision of the Boer fire, as Dr. Crow told me, that the bullet wounds averaged five per man. . . . . The Boers had evidently taken especial care to choose the ground and measure the distance before our wagon-train appeared in sight. I was told on good authority that many of our soldiers' rifles were found after the fight actually

sighted at 800 yards, whereas 300 would have been nearer the mark, and that this accounted for the few disasters among the Boers, who only acknowledged, at all events, to one man being killed outright, to one dying of his wounds, and to five who were wounded but recovered. It was just the same at Majuba, the sighting of the rifles of our men picked up by the enemy being woefully inaccurate." The book is full of interest, and is very well written.

Journal of the U.S. Cavalry Association. No. 1, vol. i. March, 1888. Pp. 125. Price 50 cents.

This is the first issue of the Journal of the U.S. Cavalry Association at Fort Leavenworth, Kansas; and its contents show that the U.S. cavalry are as anxious as that of any other army to keep in touch with the times. The New York agent for sale of the publication is Brentanos.

William of Germany: a Succinct Biography of William, German Emperor and King of Prussia. By ARCHIBALD FORBES. London: Cassell, 1888. Pp. 336. Size $7\frac{3}{4}''$ × $5\frac{1}{2}''$ × $1\frac{1}{4}''$. Weight under $1\frac{1}{4}$ lbs. Price 3*s.* 6*d.*

Written in the well-known writer's attractive style. In a work of this kind, if Homer nods over a mere secondary matter, the nod is of little importance. Was it not, however, at Gravelotte, and not at Borny, that reckless old Steinmetz had to endure his bad *quart d'heure?* For Borny the General was not responsible.

Service Afloat; or the Naval Career of Sir William Hoste. London: W. H. Allen, 1887. Pp. 357. Size $7\frac{1}{2}''$ × $5''$ × $1\frac{1}{2}''$. Weight under 1 lb. 6 ozs. Price 7*s.* 6*d.*

This is a connected story of the career of one who, a Post Captain at three and twenty, was known to his enemies as the "young Nelson," and was one of the best naval Officers of his day, 1793–1828.

A Summary of Modern Military History, with Comments on the Leading Operations. By T. M. MAGUIRE. London: Simpkin Marshall, 1887. Pp. 278. Size $8\frac{1}{4}''$ × $5\frac{1}{2}''$ × $\frac{3}{4}''$. Weight under $1\frac{1}{4}$ lbs. Price 6*s.*

This is a somewhat sketchy summary, but the author intends it only as a very elementary treatise on military history, and it may be found very useful for beginners.

Almanach für die K. K. Kriegs Marine, 1888. Pola, in Commission bei Gerold u. Co., Wein: Dulau & Co. Pp. 335. Size $5\frac{1}{2}''$ × $3\frac{1}{2}''$ × $\frac{3}{4}''$. Weight under 6 ozs. Price 4*s.*

This is apparently a semi-official publication, and it contains a considerable amount of information as regards navies not Austrian.

Reise S. M. Schiffes "Zrinyi" über Malta, Tanger, und Teneriffa nach Westindien in den Jahren 1885 *und* 1881. Zusammengestelt von K.K. Corvettencapitain J. FREIHERM VON BENKO. Pola. Gerold und Sohn, Wien, 1887: Dulau & Co. Pp. 276. Size $9\frac{1}{4}''$ × $6\frac{1}{2}''$ × $\frac{1}{2}''$. Weight under 1 lb. Price 4*s.*

The views taken by foreigners of foreign countries are always interesting, but there is not anything in this work calling for special notice.

Life in the Confederate Army. By W. WATSON. London: Chapman and Hall, 1887. Pp. 456. Size $7\frac{1}{2}''$ × $5\frac{1}{4}''$ × $1\frac{1}{4}''$. Weight under $1\frac{1}{2}$ lbs. Price 6*s.*

The author calls this book the "observations and experiences of an alien in the South during the Civil War." He is apparently an Englishman; he resided for several years immediately preceding the war in the capital of one of the Southern States, and joined the Southern Army. Mr. Watson's personal experiences in the field are full of interest, as are the views which as an outsider he puts forward with respect to the Secession question, and the opinions held with regard to it in the South. The book is well worth reading. The author, it is right to add, is an enthusiastic "volunteer," and believes in a "volunteer" army.—L. A. H.

Annual Report of the Board of Visitors to the U.S. Military Academy made to the Secretary of War for the year 1887. Washington: Government Printing Office, 1887. Pp. 135. Size 9″ × 6″ × ¾″. Weight under 1 lb. 2 ozs.

West Point holds a very high place, if not the highest among military training establishments; this report gives the reader a clear insight into the system under which the United States obtain for their small permanent army Officers thoroughly disciplined before they receive their commissions.

Rome et Berlin. Opérations sur les Côtes de la Méditerranée et de la Baltique au Printemps de 1888. Par C. Rope, Ancien Officier de Marine. Paris: Berger-Levrault, 1888. Pp. 286. Size 8¾″ × 5¾″ × ¾″. Weight under 1¼ lbs. Price 5 francs.

This is, we imagine, the biggest "Battle of Dorking" that has been published. The object of the author is, apparently, to show the weight which a large fleet properly distributed and energetically handled can bring even into a Continental war. For this purpose he recounts an imaginary campaign both by sea and land, in which France is at first opposed to Germany and Italy. Later on Denmark joins France, and at the last moment Russia takes advantage of the opportunity to pay off old scores against Germany and Austria. In the final land-battle 230,000 Germans in a defensive position near Berlin are defeated by 270,000 allied Russians, French, and Danes! The consequent rearrangement of the map of Europe can be imagined. The work is a very remarkable one, and reads like a war of real history.—L. A. H.

La Puissance Maritime de l'Angleterre. Par P. C., Officier de l'Armée Française. Paris: Berger-Levrault, 1887. Pp. 158. Size 10″ × 6¼″ × ½″. Weight under 14 ozs. Price 3*s.*

Whoever P. C. may be, he is a very bold man; but he has shown that discretion is sometimes the better part of valour by not entirely revealing his identity. He comes forward as a prophet of truth and not as a sayer of smooth things, to tell his countrymen that Perfidious Albion rules the seas even in the last quarter of this century; that a colonial empire can exist only on the condition that the mother-country is the ruler of the sea; and therefore that it will be well for France not to embark in colonial enterprises. The author is of opinion that England is little understood in France: that the importance which its naval power gives it is denied or not understood; he therefore puts before his countrymen a general view of the reasons for the existence of this power, how it has arisen; and he gives a short account of the foreign and colonial possessions of Great Britain. The book is well worth perusal.

Life in Corea. By W. R. Carles. London: Macmillan, 1888. Pp. 314. Size 9″ × 6″ × 1½″. Weight under 2¼ lbs. Price 12*s.* 6*d.*

Mr. Carles is H.M. Vice-Consul at Shanghai, and formerly acted in the same capacity in Corea. He was in Corea for some eighteen months; and in his preface he modestly says that his work is merely a portrayal of his own experience during that time. There is therefore no "padding" in the book, and it is probably worth a great deal more than more pretentious publications of the same character.

The War of the Succession in Spain. By Colonel Hon. A. Parnell, R.E. London: George Bell, 1888. Pp. 326. Size 9″ × 6″ × 1½″. Weight under 2 lbs. Price 14*s.*

This well-written book appears from the preface to be the result of great research on the part of the author, who in its preparation has consulted a great number of original MSS., as well as of other works, foreign and English. For more than this reason, however, do we commend it to the notice of those who are interested in the epoch of history of which it treats. We feel specially bound to do so owing to our having inserted in No. 147 of the Journal a notice, kindly furnished by a most competent reviewer, of Colonel Russell's "The Earl of Peterborough and Monmouth," in which is taken, of two of the most important *dramatis personæ*, a diametrically

opposite view from that held by Colonel Parnell. The reviewer characterizes the Earl of Galway as "the incapable Galway," Colonel Parnell calls him a "great Huguenot General," and a "gallant and modest soldier." The reviewer considers that Peterborough possessed "all the qualities of a great commander." Colonel Parnell says that "by instinct he was against fighting of any kind whenever it could be avoided." The reviewer says that Peterborough was "alone in pressing his colleagues to proceed with the siege of Barcelona." Colonel Parnell depicts him as its principal opponent. Between Colonel Russell, Colonel Parnell, and our friend the reviewer, we do not pretend to decide; only in justice, those who have read Colonel Russell's work should read that of Colonel Parnell.—L. A. H.

A Treatise on Navigation and Nautical Astronomy. Compiled by Staff Commander W. R. MARTIN, R.N. London: Longmans, 1888. Pp. 350. Size $10\frac{1}{4}'' \times 6\frac{3}{4}'' \times 1\frac{1}{4}''$. Weight under $2\frac{1}{2}$ lbs. Price 18*s.*

This book has been accepted by the Lords Commissioners of the Admiralty as the text-book for use in the Royal Navy, a fact which, by itself, testifies to the value of the work. Mr. Martin has combined in one volume information which should be useful to beginners and to practical navigators alike.

A Missing Chapter of the Indian Mutiny. By Lieutenant-General C. L. SHOWERS. London: Longmans, 1888. Pp. 214. Size $8\frac{3}{4}'' \times 6'' \times \frac{3}{4}''$. Weight under $1\frac{1}{4}$ lbs. Price 8*s.* 6*d.*

General Showers was, during the Mutiny, Political Resident at the Meywar States, but his reports during that period were not included in the Blue Book on the Indian Mutiny presented to Parliament. In this work the General makes the omission good. On some critical questions connected with the Government of India the author gives us the benefit of his views.

Les Torpilleurs—La Guerre Navale et la Defense des Côtes. Par le Vice-Amiral BOURGOIS. Deuxième édition. Paris: Libraire de la Nouvelle Revue, 1888. Pp. 356. Size $7\frac{1}{2}'' \times 4\frac{3}{4}'' \times 1\frac{1}{4}''$. Weight under 1 lb. Price 3*s.* 6*d.*

The views embodied in this work first appeared in three articles published in "La Nouvelle Revue." The author (Vice-Admiral Bourgois) was a distinguished Officer, who died very recently, and the preface states that he was thus prevented from supplementing or modifying his original articles. Two prominent ideas prevail throughout the work. First, a protest against the doctrines of those who advocate the bombardment of undefended towns, and the sinking, without warning, of defenceless merchant ships. Secondly, that the torpedo and the torpedo-boat cannot take the place of the ironclad. The opening chapter recounts how, in 1870, the French Fleet arrived off the small town and bathing place of Colberg. Orders had been received by the French Admiral to bombard it, but seeing its defenceless nature, he refrained and asked for further instructions which did not reach him. The author considers the action of the Admiral as humane and politic—as no advantage was to be gained. He also reprobates the idea of a torpedo-boat stealing up to a merchant ship and, without warning, sending her to the bottom. It is urged that the nationality of the vessel must first be verified, and then provision made for the crew and passengers. No law on such questions has been adopted by all nations. The only thing approaching agreement in such a direction is on the subject of explosive bullets. But the day of reckoning to a defeated nation which has had recourse to such expedients will be a heavy one, and policy, if not humanity, will prevent their being indulged in. As regards the value of the torpedo-boat in naval warfare, experience has shown its proper place to be in coast defence. So employed, it is perhaps the greatest enemy a naval force employed in blockade has to fear. It can only be efficiently met by a large number of small craft of superior speed and a light armament. Admiral Bourgois gives several instances in which torpedo-boats failed when employed far from land. It has led to a marked increase in their size, but the fact remains that a boat cannot perform the functions of a ship at sea. There is much useful information and interesting matter in this little work.—S. E. W.

Extract from the Bye-laws.

Section II.—Composition.

1. Princes of the Blood Royal; Lords Lieutenant of Counties; Governors of Colonies and Dependencies; Officers of the Army, Navy, Marines, Her Majesty's East Indian Military and Naval Forces, Militia, Yeomanry, Royal Naval Reserve, and Volunteer Corps shall be entitled to become Members, *without ballot*, on payment of the Entrance Fee and Annual Subscription.

N.B. Any Officer coming within the above definition, who may wish to become a Member of the Institution, can do so by copying one of the subjoined Forms, and inclosing it to the Secretary:—

Form for Becoming an Annual Subscriber.

_____ 18

It is my desire to become a Member of the Royal United Service Institution; and I hereby request and authorise my Agents [or Bankers], Messrs. _____, to pay my Entrance Fee (£1) and Annual Subscription (£1) now, and as it becomes due on the 1st of January in each year, to the Secretary of the Institution.

_____ Signature.

_____ Qualification for Membership.

Form for Becoming a Life Subscriber.

It is my desire to become a Life Member of the Royal United Service Institution; and I hereby authorise my Agents [or Bankers], Messrs. _____ to pay my Entrance Fee (£1) and Life Subscription (£9) to the Secretary of the Institution.

_____ Signature.

_____ Qualification for Membership.

2. Ex-Governors of Colonies and Dependencies, Retired Officers, Deputy Lieutenants of Counties, Civil Functionaries who are or have been attached to the Naval and Military Departments, the Master, Deputy Master, and Elder Brethren of the Trinity House, and Army and Navy Agents, shall be *eligible* to become Members by *Ballot*.

3. Gentlemen above the age of *fifteen*, whose names are on the list of the Commander-in-Chief for Commissions in the Army, or who are probationary for offices connected with the Naval and Military Professions, shall be *admissible*, by *Ballot*, to become Provisional Members from year to year, on payment of the Annual Subscription; and after they obtain their appointments, they may become ordinary Members on payment of the Entrance Fee.

N.B. Members admissible by Ballot must be proposed and seconded by two Members of the Institution, and their names will be submitted to the Council for election. Ballot papers may be obtained at the Institution.

Form of Bequest.

I give and bequeath unto The Royal United Service Institution, *situated in Whitehall Yard, London, the sum of* _____ *to be applied in and towards carrying on the designs of the said Institution, such Legacy to be paid out of such part of any personal Estate not specifically bequeathed as the law permits to be appropriated by Will to Charitable Purposes.*

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THE COUNCIL of the ROYAL UNITED SERVICE INSTITUTION a desirous of obtaining the assistance of OFFICERS of the NAVAL and LITARY SERVICES in carrying out the Courses of Lectures at the In tion.

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The Lectures, and the Discussions which follow them (or an Abstract of them), and Descriptions of Inventions, are published in the Journal of the Institution, subject to the discretion of the Council, and illustrated, when necessary, by Diagrams.

By order of the Council,

R. BURGESS, Captain,

Secretary.